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No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL CHEMISTRY—AGROTECHNY.

On the refractive indexes of solutions of certain proteins.—VI. The proteins of ox serum: A new optical method of determining the concentrations of the various proteins contained in blood sera. T. B. ROBERTSON (*Jour. Biol. Chem.*, 11 (1912), No. 3, pp. 179-209).—"The value of α (change in refractive index of a solvent caused by the solution of 1 gm. of protein) for the mixed proteins of ox serum is the same whether the proteins are dissolved in the native serum, or precipitated by alcohol, washed in alcohol, and ether, and dried and dissolved in $\frac{N}{100}$ potassium hydroxid. It is also independent of the dilution and is not altered by acidification of the serum. In [the] experiments the value of this constant for the proteins of ox serum was 0.00195 ± 0.00002 .

"[The] results indicate that the refractivity of the mixed proteins of ox serum is equal to the sum of the refractivities of the separate constituent proteins. For refractometric purposes the nonprotein constituents of serum may be regarded as being, substantially, $\frac{M}{6}$ sodium chlorid. The value of α for the albumins of ox serum dissolved in three-eighths saturated or more dilute solutions of ammonium sulphate is identical with its value in distilled water. I find it to be 0.00177 ± 0.00008 . The value of α for the albumins of ox serum dissolved in one-half saturated ammonium sulphate solutions is somewhat lower.

"Ox serum does not contain the crystallizable albumin which is found in horse serum. The percentages of the various proteins in ox serum have been determined refractometrically with the following results: 'Insoluble' globulins 0.76 ± 0.04 per cent, 'soluble' globulins 2.34 ± 0.10 per cent, and total globulins 3.10 ± 0.10 per cent; total albumins 5.4 ± 0.1 per cent—total proteins 8.5 ± 0.1 per cent."

Reasons are given for preferring the refractometric method to the methods at present in use for the analysis of serum proteins. A method of procedure for the refractometric analysis of serum proteins is outlined in detail.

The nitrogenous constituents of *Boletus edulis* fungi, E. WINTERSTEIN and C. REUTER (*Centbl. Bakt. [etc.]*, 2. Abt., 53 (1912), No. 18-22, pp. 566-572). The alcoholic extract of the dry fungus was found to contain trimethylhistidin and some adenin. The arginin fraction contained a base, $C_{14}H_{20}N_2O_6$. The

lysin fraction showed the presence of cholin, while the filtrate from the phosphotungstic acid precipitate contained racemic alanin. In the aqueous extract the same alloxuric bases were noted. The amino acids found were alanin, leucin, and phenylalanin. The chief volatile bases present were ammonia and trimethylamin.

In the alcoholic extract from the fresh fungus trimethylhistidin, cholin, and putrescin were detected. From 2,500 gm. of dried fungus 132 gm. of viscosein was obtained by precipitation with alcohol. The viscosein preparation showed 0.425 per cent of nitrogen and consisted to a very great extent of glycogen. The residue obtained in this method containing chitin, amorphous carbohydrate, and protein was hydrolyzed with concentrated hydrochloric acid. After concentration 20 gm. of glucosamin hydrochlorid was obtained. The mother liquors were fractionated in the usual manner and from 500 gm. of air-dry substance, which contained about 300 gm. of the protein, 130.3 gm. of esters were obtained. In this glycocol, alanin, leucin, valin, prolin, phenylalanin, asparaginic acid, and glutaminic acid were noted.

Autolyzing tests showed the presence of appreciable quantities of isoamylamin and large quantities of ammonia. Adenin could not be detected in the autolysate, but hypoxanthin and guanin were found, and probably the adenin was converted into hypoxanthin. No cholin was present in the lysin fraction, but on the other hand much putrescin (1.4 diamino butane), which was probably formed from arginin, and indications pointing to the presence of phenylethylamin and p-oxyphenylethylamin, were present.

If sterile air is passed through the autolyzing solutions humus-like masses are precipitated and from these chitosan can be obtained. The formation of nitrogen containing humic acid substances probably plays a part in soil autolysis. The protein in the fungus could not be extracted with a 10 per cent solution of sodium chlorid. The Schmiedeberg-Krakow copper-potassium method, which was used, will not render the carbohydrates soluble but the precipitation of the protein is not complete, due to denaturization.

Some digestion tests made in vitro with pepsin and trypsin are also reported. The approximate chemical composition of the air-dry fungus is as follows: Moisture 10 per cent; ether extract 4 per cent, which consists of fat 3.2 per cent, cholesterol 0.5 per cent, and lecithin; alcohol extract 12 per cent, including trehalose 3 per cent, and sugar, lecithin, bases, amino acids, purin bodies, etc., 9 per cent; extract soluble in water 28 per cent, including glycogen (viscosein) 5 per cent and sugar (trehalose, purin bodies, bases, amino acids ash, etc.) 23 per cent; and residue 46 per cent, including protein 30 per cent, amorphous carbohydrate (parasodextran) 10 per cent, and chitin 6 per cent.

The enzymes of Linacæ, J. V. EYER (*Chem. News*, 106 (1912), No. 2758, pp. 167, 168).—"Work of Armstrong and Horton has shown that the enzym and accompanying glucosid—linamarin—occurring in the wild Java bean (*Phaseolus lunatus*) belong to the β -series, and that the enzymic extract from these beans is practically without action on amygdalin but readily hydrolyzes prunasin and linamarin. Continuing this work it is now shown that this dual activity of linase—as deduced from a study of the active extract of the Java bean—is not due to the activity of a single enzym.

"Study of the Linacæ has revealed distinct evidence of the presence of a variety of enzymes in the leaf and seed of this species of plant; also, that the proportion in which they occur is subject to considerable variation. From the results found it is not possible to regard linase as being equally active toward linamarin and prunasin; consequently it must be that the extract from the Java bean contains prunase as well as linase. It may well be that linase *per se* is without action on prunasin.

* During the period of plant growth slight changes in the hydrolytic activity of the flax enzymes toward various glucosids have been observed; a decreased activity toward linamarin, and an increased activity toward prunasin and amygdalin taking place as the season advances. Enzymic activity is found to be correlated with the presence of a cyanophoric glucosid; those species of flax which resemble *Linum usitatissimum* or *L. perenne* in general habit of growth, and which carry blue, white, or red flowers, are more or less richly cyanophoric, whilst the yellow-flowered species, *L. flatum*, *L. arboreum*, *L. maritimum*, etc., which differ in habit from common flax, contain neither enzyme nor glucosid.

"The amount of cyanophoric glucosid present in different species is different, and is subject to variation throughout the period of growth. White flowering perennial flaxes invariably contain prussic acid long after its disappearance from the blue-flowered varieties of the same species.

"The development of glucosid and of active enzyme in the seed is found to be slow, and the process of ripening, although apparently without much influence on the enzymic activity, occasions a steady decrease in the amount of cyanophoric glucosid present in the seed. Ripe seed are found to contain no cyanophoric glucosid."

Linase and other enzymes in Linaceæ, H. E. ARMSTRONG and J. V. EYRE (Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 589, pp. 379-378). This has been adequately noted in the above abstract.

Cresoltyrosinase, a reagent for peptids, polypeptids, proteins and the cleavage of proteins by micro-organisms, R. CHODAT (Arch. Sci. Phys. et Nat. [General], 4. ser., 33 (1911), No. 1, pp. 79-95; abs. in Chem. Zentrbl., 1912, I, No. 13, pp. 1032, 1033).—The method of producing tyrosinase from potato peelings and its action upon paracresol in the presence of glycerol and other amino acids, upon polypeptids alone and in the presence of paracresol, and upon proteins is discussed. The author points out that by the coloration produced as a result of tyrosinase activity with the various cleavage products it is shown that native proteins and peptones are in reality polypeptids. Likewise the blue coloration with a red dichroism produced by the initial cleavage products shows without a doubt the presence of tyrosin containing polypeptids (glycyltyrosin), and finally it shows by the black coloration obtained that tyrosin is an end product. Other amino acids, like alanin, can also be detected by the coloration.

The peptids are divided into two classes by this investigator, according to whether the reagent produces only a red coloration or a blue coloration finally.

The distribution of β -enzymes in plants, H. E. and E. F. ARMSTRONG and E. HORTON (Proc. Roy. Soc. [London], Ser. B, 85 (1912), No. B 589, pp. 363-369, pl. 1).—The 4 glucosids linamarin, amygdalin, prunasin, and salicin were exposed for 24 hours at 37° C. to the action of the enzymes from the following plants: *Prunus laurocerasus*, *P. amygdalus*, *Laurus lusitanica*, *Aucuba japonica*, *Carya elliptica*, *Laurustinus*, *Skimmia japonica*, *Salix rubra*, *Epilobium angustifolium*, *E. hirsutum*, *Gaultheria shallon*, *G. procumbens*, *Arbutus unedo*, *Calluna vulgaris*, *Arctostaphylos uva-ursi*, *Vaccinium myrtillus*, *Castanea sativa*, *Vicia sativa*, *V. cracca*, *V. sepium*, *V. sylvestica*, *V. villosa*, *Lathyrus pratensis*, *L. aphaca*, *Ononis arvensis*, *Medicago sativa*, *Onobrychis sativa*, *Trifolium pratense*, *Galega officinalis*, *Lythrum, salicaria*, *Spiraea ulmaria*, *Lotus corniculatus*, *L. uliginosus*, *L. jacobaeus*, *Aquilegia vulgaris*, *Thalictrum aquilegifolium*, *Asperula odorata*, *Galium verum*, *Isatis tinctoria*, and *Rubia tinctoria*.

Influence of some antiseptics upon the action of maltase, W. KOPACZEWSKI (Biochem. Ztschr., 44 (1912), No. 5-6, pp. 349-352).—The results show that the best antiseptics, which have no influence upon the enzymatic process, are toluol

and chloroform. Mustard oil is shown to have a very strong reducing power and in the presence of Fehling's solution it is decomposed and as a result a black-green precipitate is produced which is insoluble in ferrous sulphate. This fact prevents an accurate determination of the amount of sugar present in the medium. Sodium chlorid, which possessed a slight alkaline reaction toward litmus, showed the greatest maltose formation in concentrations of from 0.4 to 0.5 per cent. The results obtained with formaldehyde substantiate those obtained a long time ago by Bokorny. In the tests with hydrochloric acid and nitric acid it is shown that the introduction of a metallic ion diminishes the inhibitory action of these acids upon the enzymes. The compounds that were used were sodium chlorid and silver nitrate.

Activation and inhibition (paralysis) of zymase and catalase activities. H. VAN LAER (*Centbl. Bakt. [etc.]*, 2. Abt., 34 (1912), No. 18-22, pp. 481-484).—The method proposed by Lebedeff for obtaining zymase by simple maceration when used with Belgian top yeast yields very active preparations. Malt extract was found to inhibit the autolysis of the coagulable proteins present in the extract, while a solution of papain was found to increase the rapidity of the digestion. While malt extract diminishes the time of maceration it increases the activity of catalase and zymase. Papain increases the activity of zymase but lowers the catalytic activity.

Influence of halogens upon diastatic and proteolytic activity. C. GERRA (*Compt. Rend. Soc. Biol. [Paris]*, 73 (1912), No. 28, pp. 354-360).—This is a continuation of some studies previously noted (*E. S. R.*, 27, p. 109) and considers the effect of chlorine and bromine upon the coagulation of boiled and raw milk, and the saccharification of ordinary and soluble starch (Ferubach) by various animal and vegetable enzymes.

The occurrence of levan in sugar. W. G. TAGGART (*Jour. Indus. and Engin. Chem.*, 3 (1911), No. 9, pp. 646, 647).—Previously noted from an article by Owen (*E. S. R.*, 25, p. 110).

Determination of dextrose in the presence of nitrogenous bodies. M. ROSENBLATT (*Bull. Sci. Pharmacol.*, 19 (1912), No. 7, pp. 411-413).—Dextrose was determined by Bertrand's method, in the presence of glycolol, alanin, leucin, tyrosin, aspartic acid, asparagin, betain, glutamin hydrochlorid, urea, and peptone (Chapoteaut and Witte). High results were obtained in the presence of glycolol and tyrosin, and low results with leucin, aspartic acid, glutamin hydrochlorid, peptone, and alanin. In some instances the errors were negligible.

Method of distinguishing between aldoses and ketoses. M. BERRI (*Gaz. Chim. Ital.*, 42 (1912), 1, No. 3, pp. 288-294; *abs. in Analyst*, 37 (1912), No. 435, p. 266).—The method is based upon the fact that *B*-naphthol-benzylamide forms crystalline compounds of amino-aldehydic character with aldoses, but does not react with ketoses. With *D*-mannose the reagent forms a compound, $C_{17}H_{19}ON:C_{11}H_7O_2$, which crystallizes in white needles melting (with decomposition) at 207 to 208° C.; with *D*-galactose it yields small prisms melting at 207° (with decomposition); with *D*-glucose, white silky needles melting (with decomposition) at 192°, and being more soluble in alcohol than the preceding compounds; and with rhamnose, white crystals melting (with decomposition) at 192°.

"In using the reagent for the separation of dextrose and levulose, a solution of 0.9 gm. of each of the sugars in dilute alcohol was added to a warm alcoholic solution of 2.5 gm. of the base, and the mixture left for 24 hours, and then allowed to evaporate spontaneously. The crystalline mass was triturated with a little water and filtered, and then washed on the filter. The filtrate

and washings contained the levulose. The residue, after being washed with petroleum spirit and crystallized from a large volume of alcohol, melted at 92°, and by treatment with dilute hydrochloric acid yielded the dextrose again."

The organic phosphoric acid of cotton-seed meal, R. J. ANDERSON (*New York State Sta. Tech. Bul.* 25, pp. 5-12; *Jour. Biol. Chem.*, 18 (1912), No. 3, p. 311-323).—It is shown that cotton-seed meal contains an organic phosphoric acid which is very similar to phytic acid and gives easily crystallizable barium salts. Whether the substance is identical with phytin could not be determined, but when it was heated in a closed tube with dilute sulphuric acid, inositol and phosphoric acid were produced.

"The aqueous solution of the free acid gives all those reactions which have been attributed previously to the presence of pyro- and metaphosphoric acids in cotton-seed meal [*E. S. R.*, 27, p. 611]. The acid when given in 0.5 and gm. doses to rabbits does not show any marked toxic properties. Symptoms of distress were produced but the animals recovered their normal appearance after 2 or 3 hours."

Concerning the organic-phosphoric acid compound of wheat bran, R. J. ANDERSON (*Jour. Biol. Chem.*, 12 (1912), No. 3, pp. 447-464).—Previously noted from another source (*E. S. R.*, 28, p. 17).

The purpling chromogen of a Hawaiian *Dioscorea*, H. H. BARTLETT (*U. S. Dept. Agr., Bur. Plant Indust. Bul.* 264, pp. 19, pl. 1, fig. 1).—A chromogen in the shape of a brown resinous compound, termed rhodochlorogen, was isolated from the air potato (Hawaiian bitter yam) which in dilute neutral or acid solutions is yellowish and forms intensely wine-red solutions on treatment with plant oxidases or weak inorganic oxidants and intensely green alkali salts before and after oxidation.

The chromogen was soluble in alcohol, acetic ether, and chloroform, moderately soluble in ether, and insoluble in petroleum ether and water. It was not possible to obtain it in a crystalline condition.

A second chromogen was also noted in the precipitate obtained when the ammonia-greening chromogen (rhodochlorogen) was treated with lead acetate, dried, triturated with acetic ether, and slightly acidified with acetic acid. By this process a small amount of the precipitate was decomposed. After some further treatment a brown resinous mass was obtained which was similar in appearance to the ammonia-greening chromogen described above. The ammonium salt of the red oxidation product of this preparation is a purple compound insoluble in water and acetic ether.

Both of these chromogens have a similarity to the anthocyanins. "Many investigators have supposed that the anthocyanins were closely allied to the tannins. In this connection it is especially interesting that during the process of purification rhodochlorogen was separated from tannin by the use of lead acetate and ferrous sulphate. Lead acetate did not precipitate rhodochlorogen, but did precipitate its red oxidation derivative . . . There is strong circumstantial evidence that the chromophoric nucleus in the molecules of rhodochlorogen and anthocyanin is identical and therefore that the two substances are in some way genetically related in the plant metabolism . . .

"In regard to the ammonia-purpling chromogen of *Dioscorea* tubers little can be said. It has been obtained in sufficient quantity for only a few tests and was probably not even approximately pure. It may be pointed out, however, that in its color reaction it resembles some of the nonammonia-greening anthocyanins."

Zygadenin.—The crystalline alkaloid of *Zygadenus intermedius*, F. W. HELL, F. E. HEPNER, and S. K. LOR (*Wyoming Sta. Rpt. 1912*, pp. 51-57, *Ag. 2*).—Continuing previous work (E. S. R., 27, p. 881), the authors have now extracted a large quantity of the leaves of *Z. intermedius* and succeeded in isolating a crystalline alkaloid which has been termed zygadenin. It melts at 200 to 201° C. and the formula, $C_{11}H_{15}NO_3$, has been assigned to the alkaloid provisionally as the molecular weight determinations are to be duplicated.

"An acid solution of the alkaloid yields a voluminous precipitate with Meyer's reagent, and a beautiful aurichloride is formed when to the hydrochloric acid solution of the base an acid solution of auric chlorid is added. This salt is soluble in hot water, and crystallizes in elongated, dense prisms upon cooling. It has not yet been analyzed.

"The alkaloid is levorotatory; 0.7028 gm. dissolved in 25 cc. chloroform was found to rotate 2.7° to the left in a 2 decimeter tube. The specific rotation is therefore - 48.2°."

Zygadenin crystallizes in orthorhombic blocks from alcohol. The crystals are illustrated.

A chemical investigation of the composition of the oil of chenopodium, E. K. NELSON (*U. S. Dept. Agr., Bur. Chem. Circ. 109*, pp. 8).—In some previous work (E. S. R., 25, p. 506) it was noted that hydrating ascaridole by shaking with ferrous sulphate gives the same glycol that occurs when this substance is carefully heated to 150° C.

By further study it has now been noted that in addition to the glycol two other crystalline substances are formed, one in larger and the other in smaller amounts. One of these substances was designated β -glycol, $C_{10}H_{16}O_4$, and the other is an erythrite corresponding to the formula $C_{10}H_{16}O_4$. "When this 'erythrite' is boiled with dilute sulphuric acid it is decomposed. The products of dehydration have not as yet been thoroughly studied, but a ketone with strong menthone odor and a peculiar crystalline phenolic substance, melting at 80 to 81°, have been separated. The semicarbazone of the ketone melts at 182 to 184° and was difficultly soluble in the ordinary solvents. This melting point is much lower than that reported by Wallach for the semicarbazone of Δ^1 menthenone, melting at 224 to 226°, and obtained as a product of dehydration from 1,3,4, trihydroxyterpane, so that possibly this is an isomeric menthenone, or a mixture of isomers. On the basis of the formula proposed by the author for the glycol anhydrid, which is the product formed of heating ascaridole to 150°, it is not easy to account for the formation of the erythrite." On this account it is now proposed to substitute the structure formula proposed by Wallach, who states that it is a 1,4 instead of a 2,3 peroxid. With this formula, which is well supported by facts, it is easier to account for the fact that the hydration of the rearrangement product leads to the formation of more than one glycol."

Some additional data on the structure of erythrite, etc., are presented in detail. "Chenopodium oil, after being kept for a year at ordinary temperature, increases in gravity and decreases in optical rotation."

The distribution of fluorin in animal and vegetable tissues, and its estimation in minute quantities, G. W. MONIER-WILLIAMS (*Chem. World*, 1 (1912), No. 8, pp. 255-257).—This is a review of the existing methods for the detection and estimation of small amounts of fluorin. A reliable method for estimating traces of fluorin is considered still a desideratum.

A new apparatus for the volumetric determination of carbon dioxide, H. W. BROWAKER (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 8, pp. 599, 600, 601).—When the Bowser method (E. S. R., 27, p. 806) was tried out by a class

of students some objectionable features were found in the apparatus which could not be overcome unless the operator using the method was skilled. In order to make the method applicable to the use of inexperienced persons a piece of apparatus was devised which is illustrated.

Revision of the methods for the gravimetric determination of magnesium. Z. KARAOGLANOV (*God. Sofiskia Univ. (Ann. Univ. Sofia)*, 7 (1910-11), pt. 2 [Art. 1], pp. 3-57).—The method for determining magnesium has been improved, and a slight modification made in the sulphate method by which the results obtained agree very well with those obtained by the oxid method. The cause of the blackening of the magnesium pyrophosphate precipitate was also studied. When the Gibbs, Schmitz, and Neubauer methods were compared with the oxid and sulphate methods, the highest results were obtained by the Neubauer method, while the Schmitz and Gibbs methods furnished the lowest results. The Pellet method can not be used for quantitative purposes because no magnesium sulphopyrophosphate is produced.

Analysis of sodium arsenate. H. CORMINGEUR (*Ann. Chim. Analyt.*, 17 (1912), No. 5, pp. 161-163; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 397, II, pp. 683, 685).—The method, which is intended for samples of sodium arsenate for insecticidal purposes, is as follows: "Five gm. of the sample is ignited at a low temperature (in order to destroy the coloring matter which is usually present in the commercial product), and then dissolved in about 150 cc. of water; this solution is titrated with N/1-sulphuric acid, Orange IV being used as the indicator. Let the number of cubic centimeters of acid required be denoted by x . Phenolphthalein is now added, and the solution titrated with N/1-sodium hydroxid solution, the quantity required being expressed by x' . Then the percentage quantity of arsenic acid present is $x \times 0.115 \times 20$. If the number x is equal to x' , the product is dihasic, and the percentage quantity of sodium acid present is $2x \times 0.031 \times 20$, but if not, the amount of sodium acid is $[(x \times 0.031 \times 20) + (x' \times 0.031 \times 20)] \times 2$."

Some factors influencing the quantitative determination of arsenic in soils. J. E. GRAVES (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 15 (1912), Sect. VII, pp. 121-128, fig. 1; *Jour. Amer. Chem. Soc.*, 35 (1913), No. 2, pp. 150-156, fig. 1).—In order to determine the influence of iron upon the amount of arsenic evolved in the Marsh method tests were made with solutions containing varying amounts of iron and constant amounts of arsenic. Traces of iron were introduced for the purpose of accelerating the action of the acid upon the zinc used in the test. "From the results it may be seen that the arsenic recovered decreases very rapidly as the iron added increases. In fact, the amount retained is almost directly proportional to the amount of iron introduced. Even as small amount as 1 mg. of iron in these tests was sufficient to retain one-fourth of the arsenic, so that even traces of iron must be considered in determining arsenic by the Marsh method."

In accordance with Harkins' suggestion* the retaining action of iron can be prevented by the addition of 200 mg. of stannous chlorid. The retaining influence of 1 gm. of iron was found to be neutralized completely by 14 gm. of stannous chlorid. A soil in which 40 per cent was soluble in hydrochloric acid (specific gravity 1.115) and containing 2 per cent of iron was found to be free from arsenic. This soil was then studied with additions of arsenic, and as a result of this work the following method is recommended:

Ten gm. of soil (where the amount of arsenic in the soils is small larger samples should be used) is weighed into a casserole to which is added 25 cc. of

* *Jour. Amer. Chem. Soc.*, 32 (1910), No. 4, pp. 518-530, fig. 1.

concentrated arsenic free nitric acid and the mixture heated on a hot plate for 30 minutes. While still moderately hot there is added to this 10 cc. of concentrated sulphuric acid and the whole heated for 30 minutes longer. The soil is taken up and thoroughly washed with hot distilled water, the filtrate evaporated to dryness, and heated until free from nitrates. The residue is treated with dilute arsenic-free sulphuric acid to which is added 20 cc. of stannous chlorid solution, 1 cc. of which contains one-tenth of a gram of stannous chlorid. This solution is slowly introduced into a Marsh apparatus, the glass tube through which the hydrogen is conducted being heated by means of an electric combustion furnace. The deposit of arsenic is carefully weighed on fine analytical balances.

By this method very small quantities of arsenic can be accurately determined as is shown by the reported results.

The nitrogen groups contained in peat and the cleavage of ammonia from it through the agency of superheated steam, G. I. RITTMAN (*Izv. Moskov. Sel'sk. Khoz. Inst. (Ann. Inst. Agron. Moscow)*, 18 (1912), No. 2, pp. 323-333).—This is a report of tests in regard to the determination of the various nitrogen groups present in peat. The amid nitrogen was determined by Sachse's method, which, however, was found to work well only for the amino solutions.

The amount of nitrogen split off as ammonia was greatly dependent upon the time of boiling with dilute hydrochloric acid, and the author accordingly found it best to boil for 4 hours. The amount of amid nitrogen found in various peats varied, but was around 15 per cent of the total nitrogen. The quantity of diaminic nitrogen depended only slightly upon the time of boiling the sample with dilute hydrochloric acid. Superheated steam split off the ammonia very rapidly at about 200° C. No connection between the nitrogen groups in peat and the amount of ammonia split off by superheated steam was noted. The most ammonia was released from peat obtained in a low moor.

Note on the neutral permanganate method for the availability of organic nitrogen, J. P. STREET (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 6, pp. 437, 438).—Previously noted from another source (*E. S. R.*, 27, p. 205).

A study of the cause of the partial insolubility of potash salts when mixed with basic slag, T. E. KERR (*South Carolina Sta. Rpt. 1912*, pp. 81-83).—The results of these experiments show that a large part of the potash which when unmixed is soluble in water becomes insoluble when mixed with basic slag. "A determination of the water soluble lime content before and after mixing indicates that there is no interaction between calcium and potassium. By elimination, it appears that there must be a combination in which the iron and potash are involved. The compound is insoluble in hot water, but almost entirely soluble in hydrochloric [acid] of 1.115 specific gravity." "If this compound is dissolved there is so much iron present that it occludes the potash to such an extent that it is necessary to use large dilutions and many reprecipitations to separate the potash."

This investigation will be continued for the purpose of determining the solubility of the hot water insoluble potash in ammonium citrate and citric acid. It is thought that the occlusion of potash by iron probably accounts for the many complaints which are made by mixers that certain goods do not show the amount of water soluble potash that they should and do in other cases.

In addition to this it is to be determined whether there is any relation between the iron content and the content of potash insoluble in water in certain mixtures of acid and potash that were found deficient by the fertilizer count during the past year.

The estimation of potassium, especially in fertilizers, soil extracts and plant ashes, W. A. DAVIS (*Chem. World*, 1 (1912), No. 7, pp. 219, 220).—"In view of the grave errors to which the platinum method is subject, there seems no good reason for longer retaining it, in view of the fact that a more accurate and simple method of analysis exists in the perchloric method. Its abandonment is, moreover, desirable not only on grounds of economy, but as eliminating the vexed question as to the value that shall be chosen for the atomic weight of platinum in potash analyses. In the perchloric acid method the ratios involved are the simple molecular ratios such as $\frac{\text{KClO}_4}{\text{KCl}}$, or $\frac{2\text{KClO}_4}{\text{K}_2\text{O}}$, in which the atomic weights used have all been accurately fixed."

Estimation of nitrates in waters, H. F. KNIGHT (*Chem. World*, 1 (1912), No. 7, p. 247).—Two methods with which the author has had experience are described as satisfactory and simple.

In the first method, the phenol sulphuric acid is replaced by a 1 per cent solution of salicylic acid in sulphuric acid, which may be prepared in a few moments. From 10 to 50 cc. of the water to be tested is evaporated with 1 cc. of the salicylate solution to a low bulk on a water bath, until a thick syrup is obtained. This is then diluted with 10 cc. of water, allowed to stand for a few moments, poured into a Nessler tube with 10 cc. of ammonia or solution of caustic soda, and the depth of the yellow color compared with that obtained by treating in a similar manner known quantities of potassium nitrate. The presence of chlorids does not affect the results, and for most samples 10 cc. is deemed ample for a determination.

The second method "has many points of preference over the former, not the least of which is that it may be directly applied to any water without the preliminary concentration with the reagent, and further the blue color which is produced is more easily matched than the yellow of the former method, and artificial light is just as good as daylight for the purpose. The reagent used may be either diphenylamin or its hydrochlorid, dissolved in pure concentrated sulphuric acid, a suitable strength being about 0.25 per cent, or say 0.5 gm. in 100 cc. of acid. If 1 cc. of the water under test is mixed in a Nessler tube with 3 drops of the reagent and 10 cc. of pure sulphuric acid added, a blue color is produced in degree according to the amount of oxidized nitrogen present, and is compared with the color obtained by using a standard solution of potassium nitrate containing 1 to 2 parts of N_2O_5 per 100,000, the match test being made by taking 0.1 to 1 cc., making the fraction of 1 cc. up to 1 cc. with distilled water, and adding 10 cc. of sulphuric acid as before. . . . In cases where sulphuric acid, free from oxids of nitrogen, is difficult to obtain, then method 1 is to be recommended, as the amount used is only one-tenth of that used in the diphenylamin method."

The value of Eijkman's fermentation test conducted at 46°C . as an aid for examining drinking water, F. H. MEHEWERTH (*Centbl. Bakt. [etc.]*, 1. Abt. Orig., 65 (1912), No. 1-3, pp. 213-220).—The method consists of incubating the water in question at 46°C . in a fermentation flask which contains one-eighth of its volume of a sterile aqueous solution containing peptone (10 per cent), glucose (10 per cent), and sodium chlorid (5 per cent). When the *Bacillus coli* is present amongst other organisms it gains the upper hand quickly at this temperature and in 24 hours an almost pure culture is obtained. In the process the fluid becomes cloudy and active fermentation is present.

The author also found that amongst a number of coli strains, all of which were morphologically characteristic and obtained from the intestinal tract of man, only 38.8 per cent fermented glucose (dextrose) at 46°C . Certain differ-

ences were also noted for other carbohydrates, but the greatest variation was with saccharose. The fermentation test conducted in this manner is therefore of no definite value for detecting this organism.

Report of the international committee for food products, A. J. J. VANDE VELDE (*Ghent, 1912, pp. 209*).—This is a report of the committee for the unification of the analytical methods for food products during 1909, 1910, and 1911, and includes the propositions up for discussion at the Eighth International Congress of Applied Chemistry, held at Washington and New York, 1912.

Artificial coloring of food and condiments, E. SPÄETH (*Pharm. Zentralhalle, 55 (1912), Nos. 18, pp. 465-473; 19, pp. 496-501; 20, p. 552; 21, pp. 558-564; 22, pp. 595-601; 23, pp. 626-629; 24, pp. 654-658; 25, pp. 685-690; 28, pp. 781-784; 29, pp. 810-813; 30, pp. 840-845; 31, pp. 871-874*).—This is a continuation of work previously noted (*E. S. R., 25, p. 712*), and includes goods made from flour with and without eggs, viz. egg noodles, biscuits, and cakes, with special reference to the artificial coloring of these products.

The biological methods for detecting horse meat in pork products, G. BLANC (*Ann. Patisf., 5 (1912), No. 44, pp. 274-281*).—This is a discussion in regard to the value of the precipitin method for detecting horse meat which has been added to pork products.

In using this reaction it is absolutely necessary when making comparative tests to use the same antiserum, i. e., a serum of practically the same titer. Antisera may be obtained which will give a reaction in 1:20,000 for preparations containing 5 per cent of added horse meat, but this is a rare occurrence. The average sera, however, oscillates in the neighborhood of about 1:10,000.

The determination of total solids in potatoes, H. BJÖRN-ANDERSON (*Ztschr. Analyt. Chem., 51 (1912), No. 6, pp. 341-359, pl. 1*).—Previously noted from another source (*E. S. R., 25, p. 109*).

An investigation of some important methods for examining honey, J. FIEBE and P. STERNMÜLLER (*Arb. K. Gsndhtsamt., 40 (1912), No. 3, pp. 305-356, fig. 1*).—The gravimetric methods are considered the only ones which will furnish accurate results for the total solids in honey. For the indirect determination of total solids Windisch's cane sugar table is recommended, but in any event it will yield only approximate figures. For the determination of free acids sensitive blue litmus paper should be chosen as the indicator. As formic acid has not been definitely found in honey it is advisable to report the results obtained in cubic centimeters of normal alkali. The alkalinity of honey ash can be determined in conjunction with the titration for the phosphates. The phosphates are valuable for judging the quality of honey.

In determining sugar by Fehling's solution it is optional whether the copper is weighed in the metallic state or as oxid. Saccharose can be best determined gravimetrically, as the polarimetric method yields only approximate results. For the detection of artificial invert sugar Ley's method is of no value, whereas Flehe's reaction on the other hand, especially in conjunction with the enzym test, is very valuable for this purpose, as well as for detecting starch syrup and glucose (dextrose) in honey. For detecting honeys heated to over 55° the diastase method is a positive test. Precipitation of proteins according to the Lund method is of no value.

Determination of sugar in sweetmeats and sirups, CROCHETTELL and MILLS (*Rev. Chim. Indus., 23 (1912), No. 286, pp. 87-89*).—By using the formula

$$g = \frac{198 R + 100 \left(D - \frac{46.5 S}{100} \right)}{303}$$

the amount of glucose present in the sample under observation can be determined. In this formula R equals the amount of reducing sugars present as determined by means of copper hydroxid, D the deviation in rotation after inversion, and S the sucrose as determined by Clerget's formula. Levulose is estimated by subtracting the percentage or amount of glucose from that of the reducing sugars found.

Determination of sugar in beets by hot aqueous digestion, E. SAILLARD (*Rev. Gén. Chim.*, 15 (1912), No. 4, pp. 64-66).—A discussion of the accuracy of this method and the factors which influence the results obtained with it. The method is deemed satisfactory.

Analysis of beeswax and carnauba wax.—Determination of hydrocarbons, A. LEYS (*Jour. Pharm. et Chim.*, 7. ser., 5 (1912), No. 12, pp. 577-588; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 13, p. 649).—"Ten gm. of the wax is boiled for 20 minutes with 25 cc. of alcoholic potassium hydroxid (45 gm. per liter of absolute alcohol) and 50 cc. of crystallizable benzene, in a flask with a tube and tap at the side, so that it can also serve as a separating funnel. An addition of 50 cc. of hot water is then made, and the heating continued for about 10 minutes under a reflux condenser, after which the contents of the flask are allowed to separate into layers, and the boiling lower alcoholic soap solution is drawn off. The benzene is heated with 50 cc. of water beneath a reflux condenser, the water drawn off as before and the benzene containing a mixture of alcohols and hydrocarbons is evaporated in a basin. The residue is now treated with 100 cc. of hot amyl alcohol, added in several portions, each of which is transferred to a flask, and the whole is heated on an asbestos plate while 100 cc. of concentrated hydrochloric acid is added with continual stirring until the mixture has become completely fluid.

"This mixture of acid and amyl alcohol effects a separation of wax alcohols and hydrocarbons on cooling. The hard top layer which separates on cooling is dissolved in a mixture of 25 cc. of amyl alcohol and hydrochloric acid and the solution again cooled, the cake of hydrocarbons then being removed, pressed between filter paper, heated on the water bath in a tared basin, and weighed. The alcohols remaining in the lower layer are heated with a large excess of water and cooled, the lower layer of diluted hydrochloric acid is drawn off, the amyl alcohol solution of the wax alcohols is evaporated on the water bath, the residue taken up with benzene, the solution evaporated, and the final residue weighed.

"Two samples of pure beeswax thus examined yielded 10.44 and 13.03 per cent of hydrocarbons and 39.21 and 39.6 per cent of alcohols respectively, while a sample of carnauba wax gave 49.22 per cent of alcohols, but no hydrocarbons. Further information may be obtained by determining the liquid fatty acids, separated by treatment of the lead salts with benzene. In the case of the two samples of beeswax mentioned, the amounts calculated as oleic acid were 8.4 and 8.52 per cent, respectively."

Edible vegetable oils and fats, G. HALPHEN (*Huiles et Graisses Végétales Comestibles. Paris and Liege, 1912, pp. VIII+498, figs. 16*).—This work deals with the chemical changes taking place in vegetable oils and fats, preparation of samples for analysis, detecting and determining foreign substances, chemical and physical properties of vegetable oils and fats, and special chapters on olive, peanut, cotton seed, rape, nut oil, cotton-seed oil-margarin, sesame, and coconut oils. The laws in regard to the sale and consumption of vegetable fats and oils for France are also included.

Methyl alcohol, vinegars, etc., L. CALVET (*Alcool Méthyllique Vinaigres. Paris and Liege, 1912, pp. 367, figs. 11*).—This publication deals with the meth-

ods of examining denatured alcohol and of preparing methyl alcohol and vinegars of various kinds, and discusses different kinds of acetates and acetone. The laws relating to the sale of the above substances are also considered.

A new use for potatoes, H. C. PRICE (*Sci. Amer.*, 107 (1912), No. 1, p. 3, figs. 3).—This is a popular description of the potato drying industry as carried out in Germany. Some of the drying machines are pictured, and the advantages of the systems mentioned are discussed.

Manufacturing casein in Denmark by cooperative institutions (*Markertid.*, 2; (1911), No. 38, pp. 1927-1939; *abs. in Milchw. Zentbl.*, 41 (1912), No. 7, pp. 219-224).—Descriptions are given of methods for the preparation of dried casein by acid (lactic, sulphuric, hydrochloric or acetic) and with rennet.

The majority of factories in Denmark produce a casein product with acidified whey. On the average 100 lbs. of skim milk will yield about 3 lbs. of casein and 90 lbs. of whey. The cost of production under Danish conditions is discussed in detail.

Some further investigations in regard to the micro-organisms present in fermenting tea, W. STABER (*Bul. Jard. Bot. Buitenzorg*, 2, ser., 1912, No. 5, pp. 56).—Under normal conditions micro-organisms (yeasts and bacteria) do not influence the time of fermentation of tea. If during the various stages of the process a pure culture of yeast is added the finished product is not appreciably improved. Bacteria when added in large amounts destroy both the tea leaves and the yeast. Two strains of bacteria were isolated in this work, one from a normal fermenting tea and another from a tea undergoing abnormal retarded fermentation.

An examination of the oleoresins of some western pines, A. W. SCHOMER (*U. S. Dept. Agr., Forest Serv. Bul.*, 119, pp. 36, pl. 1, figs. 4).—This is a chemical study of the oleoresins of the western yellow, digger, sugar, lodgepole, and piñon pines, in connection with tapping experiments previously noted (*E. S. R.*, 28, p. 149).

"With the exception of the digger pine, the volatile oil from all the species examined consists of terpenes ($C_{10}H_{16}$), and the sesquiterpenes ($C_{15}H_{24}$). The oil from the digger pine consists of the hydrocarbon heptane (C_7H_{16}), a normal constituent of petroleum."

The chemical and physical constants of the various rosins obtained from the species examined, as well as the constants of a commercial rosin, are given. Some comparisons were also made with an average gum turpentine which consists of a mixture of the volatile oils of the Cuban pine and the longleaf pine.

The methods used in the investigation are described in detail.

Wood turpentines, L. F. HAWLEY (*U. S. Dept. Agr., Forest Serv. Bul.*, 165, pp. 69, figs. 54).—This investigation was carried on at the Forest Products Laboratory maintained by the Forest Service of this Department at the University of Wisconsin. The crude wood turpentines were considered from the standpoint of analysis, refining, and composition.

Pulp and paper and other products from waste resinous woods, F. P. VETTER and J. L. MERRILL (*U. S. Dept. Agr., Bur. Chem. Bul.*, 159, pp. 28).—The results of a study, made to show that a combination of the pulp, paper, turpentine, and rosin oil industries would make a logical and profitable industrial condition, are reported. The experiments were conducted with what is known in the South as "lightwood," which is longleaf yellow pine that has lain in the forest until all the sap wood has decayed, leaving the heart wood sound.

It was found that from 4,000 lbs. of cord air-dry wood, equivalent to 320 lbs. of moisture-free wood, a total of \$43.17 worth of material can be obtained, as follows: Refined wood turpentine, 6 gal., at 40 cts., \$2.40; pine oils, 7 gal. at

5 cts. \$2.45; rosin spirits, 11 gal. at 20 cts., \$2.20; rosin oils, 40 gal. at 35 cts., \$14.00; phenoloids, 12 gal. at 6 cts., 72 cts.; crude methyl alcohol, 3.5 gal. at 35 cts. \$1.20; and unbleached pulp, 1,440 lbs., at 1½ cts., \$25.20.

The products were of good quality. "The wood turpentine, pine oils, and rosin spirits are suitable paint and varnish thinners, especially for outdoor work; the rosin oils are suitable for making greases; the phenoloids are used for shingle stains and preservatives; and the pulp for making a good strong brown wrapping paper quite similar to that now selling from 3 to 4 cts. per pound."

The detection of faulty sizing in high-grade papers, C. F. SAMMET (*U. S. Dept. Agr., Bur. Chem. Circ. 107, pp. 3, pls. 3*).—The test described was devised for the purpose of differentiating between the relative values of the sizings of papers, which methods now in use fail to detect.

"The test consists in drawing a strip of paper over the surface of an iron laminate ink and allowing it to drain and dry naturally. Upon examining this inked surface with a magnifying glass it will be found that a well-sized paper will show no indication of the fiber having absorbed the ink, and the entire surface will be uniformly and lightly colored. . . .

"Sizings may be further differentiated by rubbing the surface of a paper with an ink eraser, brushing off the loose particles, and proceeding as directed. A paper which is well sized through will still be uniformly colored and the fibers will take the ink but little.

"The test is valuable in showing the faults of mill practice, especially as to whether in the sizing of high-grade papers the best results obtainable are being procured."

Extracts from the proceedings of the Association of Official Agricultural Chemists, 1912 (*U. S. Dept. Agr., Bur. Chem. Circ. 108, pp. 18*).—This material has been substantially noted from another source (*E. S. R., 27, pp. 495*).

METEOROLOGY—WATER.

The climatic limits of wheat cultivation, with special reference to North America, J. F. UNSTEAD (*Geogr. Jour., 39 (1912), pp. 347-366; abstr. in Jour. Bd. Agr. [London], 19 (1912), No. 9, pp. 742-749, fig. 1*).—This paper presents the climatic requirements for wheat culture and the possible limits of its extension, particularly the northern limits. It gives the accumulated and mean temperatures and duration of light for a considerable number of places in the representative wheat-growing regions of the world, and presents a diagram prepared from these data which shows the relation between the accumulated temperatures and the index numbers of mean temperature plus mean duration of darkness during the periods of growth, from which it is possible to determine whether wheat can be grown at a given place provided the necessary data for temperature and duration of light are known.

The paper also discusses the rainfall requirements of wheat, and on this basis defines two types of wheat-growing country, "(1) that with a relatively mild winter with rain in the cooler parts of the year, where the grain is sown either in autumn or spring, and ripens before the hottest parts of the summer; and (2) that with a more extreme climate with rain during the hotter part of the year, where the grain may perhaps be sown in the autumn, but is more commonly sown in spring, and in either case grows during the spring and summer, ripening at almost the hottest part of the year."

Applying these studies of temperature and rainfall as related to wheat growing, the author concludes that an enormous extension of the wheat-growing area is possible. "With regard to wheat production in North America, two facts,

however, are clear, first, that the total acreage will be very much greater than it is at present, since it may be extended into the colder regions in Canada, and into the drier regions both in Canada and in the United States; second, that the yield per acre on the lands at present cultivated will increase as a result of scientific investigation and its application by farmers. Although the yield on the semiarid lands is likely to be less than on the better-watered lands, even this lower yield may exceed the average yield of the present time. Hence a production double that of the present is quite possible as far as the physical conditions are concerned."

The relation of forests and mountains to the conservation of snow, J. E. CHURCH, JR. (*Met. Ztschr.*, 30 (1913), No. 1, pp. 1-10, pls. 2, figs. 9).—This is an account of studies by the Nevada Experiment Station which have been more briefly reported elsewhere (*E. S. R.*, 27, p. 617).

Meteorological summary for the year 1911, J. F. WILSON (*Wyoming Sta. Rpt.* 1912, pp. 75-78).—Monthly summaries are given of observations at Laramie, Wyo., during 1911 on temperature, pressure, precipitation, humidity, sunshine, cloudiness, and wind movement. A record of soil temperature at depths of 3, 6, 12, 24, 36, and 72 in. during 1911 is also given.

The highest temperature was 86° F., August 31; the lowest, -26°, January 2. The total precipitation was 9.93 in. The lowest relative humidity was 21 per cent, July 9. Light frosts occurred August 3 and 28, a killing frost August 28. The greatest velocity of wind (southwest) was 60 miles per hour, January 7.

Water: Its purification and use in the industries, W. W. CHRISTIE (*New York*, 1912, pp. XI+219, figs. 79).—This book, intended to be helpful "not only to engineers but also to students," deals with sources, impurities, tests, and uses of water; cold and hot softening processes; filtration, aeration, and sterilization; purification of water for drinking purposes; measurement of water; and treatment of boiler waters. A number of "tables of value to users of water for manufacturing and industrial purposes" are included.

Industrial sterilization of water with ultraviolet light, M. von RECKLINGHAUSEN (*Gasdhts. Ingen.*, 34 (1911), No. 9, pp. 166-169, figs. 4).—The principles of this process are explained, the apparatus used is described, and tests with a Westinghouse sterilizer, using a mercury vapor lamp, are reported.

With this apparatus, using a 3-ampere, 220-volt lamp, water was quite thoroughly sterilized at the rate of 600 cubic meters per day (24 hours). *Bacterium coli* was completely destroyed by the treatment and other germs were largely killed. There was, however, a slight increase in molds after the treatment, which is attributed to the way in which the apparatus was installed and may be overcome by a different arrangement. Nevertheless the treatment converted water which was considered unfit for drinking purposes into water which would be classed as of superior quality.

The relative manurial value of Nile water and sewage, A. LUCAS (*Cairo Sci. Jour.*, 7 (1913), No. 76, pp. 1-9).—The author quotes analyses by Mackenzie showing that the flood silt of Nile water contains 0.16 per cent of nitrogen and 0.25 per cent of phosphoric acid and that the water contains in solution 1.6 gm. of nitrogen and 3.5 gm. of phosphoric acid per cubic meter. The average sewage of several small disposal works was found to contain 50.25 gm. of nitrogen per cubic meter.

This sewage may be considered "as Nile water enriched with the special plant foods that are deficient in the soil and that are required by the crops. In a rainless climate, such as that of Egypt, the application of the sewage to the land forms an ideal method of disposal. Sandy soils, such as those of the Carlo and Port Said sewage farms, which are in special need of nitro-

gen and other manurial constituents, are preeminently fitted for sewage disposal. In the process of applying sewage to the land, not only does the land benefit enormously but at the same time the sewage is effectually purified."

One solution of the sludge problem, A. HINDLE and P. H. WHITAKER (*Surveyor*, 42 (1912), Nos. 1072, pp. 163-165, fig. 1; 1913, p. 207).—A method in which layers of straw and sludge are alternately laid down in the sedimentation tank is described. It is stated that in this way a peculiarly valuable fertilizer is obtained.

Sewage treatment: Advantages of land over artificial schemes, J. MANLEY (*Jour. Roy. Sanit. Inst.*, 34 (1913), No. 1, pp. 53-59).—This article cites statements by various authorities and refers to sewage-disposal works, giving results of successful land treatment of sewage.

SOILS—FERTILIZERS.

The practical classification of soils, E. O. FIRPIN (*Proc. Amer. Soc. Agron.*, 3 (1911), pp. 76-89, fig. 1).—The author discusses briefly the history and principles of soil classification and presents a scheme of organization of the different factors which have been used in the classification of soils, particularly as developed by the work of the Bureau of Soils of this Department.

According to this scheme soils are classed by (1) region (temperature) as temperate, subtropical, and tropical; (2) section (humidity) as humid, semi-arid, and arid; (3) division (mode of formation) as sedentary and transported; (4) province (mode of formation) as residual, cumulese, gravity (colluvial), water, ice (glacial), and wind (eolian); (5) group, as source of materials; (6) series, as color, organic matter, drainage, lime content, and special chemical properties; and (7) type, as texture and structure.

It is thus seen that the basis of the proposed classification is the climate and the geological formation. "The scheme is, therefore, genetic and in its broader lines purely geological."

The volumetric composition of cultivated soils, T. BÉLER-CHATELAIN (*Internat. Mitt. Bodenk.*, 2 (1912), No. 4, pp. 343-350, figs. 5; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 12, pp. 2595-2600).—The author proposes a method of physical analysis of soils on the basis of their relative proportions of mineral soil particles, water, and air per definite volume of soil.

It is believed that the method is of more practical value than the usual mechanical analysis in that it gives a clearer insight into the physical constitution of a soil in its undisturbed state.

General characteristics of the morphology of soils according to zones and their variations, G. TOMIN (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 13 (1912), No. 3, pp. 321-353, figs. 16; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 10, pp. 2130-2132).—The author regards the soil as a complex of horizons, each derived from a distinct rock formation by the intermingling of humus with the rock material (so-called "humofixation") and the decomposition of the rock minerals by the humus (so-called "humofixation"). Soils having horizons of the same characteristics constitute a morphological type. On the basis of such characterization of horizons, the author presents a scheme of classification of the podzol, chernozem, and alkali soils of Russia.

Alkali soils and their utilization in dry farming, F. COUSTON (*Bul. Agr. Algérie et Tunisie*, 18 (1912), Nos. 16, pp. 373-385, fig. 1; 17, pp. 401-412, fig. 1).—The author reports a study of the distribution, formation, character, and utilization of the alkali soils of the Department of Oran, Algeria.

These soils cover an area of approximately 2,470,000 acres and are divided naturally into those of the upper plains and those of the lower plains. The soils of the upper plains are not irrigated, and the salt content is due to capillary rise of the water from below. The soils of the lower plains are irrigated, and it is pointed out that irrational application of the water has greatly increased their salt content. Sodium chlorid is the principal salt constituent.

The author holds that the nonirrigated soils of the upper plains can be best utilized by dry-farming methods, which reduce evaporation of moisture to a minimum and thus prevent accumulation of alkali at the surface of the soil. The lower plains soils may be benefited by more careful use of irrigation water and by incorporation of organic matter to improve the physical condition of the soil and reduce the amount of irrigation water required.

The soils and agricultural resources of Robertson County, Tenn., R. F. ROBERTS (*Resources Tenn.*, 2 (1911), No. 12, pp. 442-457, figs. 2).—This is a brief account of a soil survey of this county conducted by the state geological survey in cooperation with the Bureau of Soils of this Department, and describes the different soil types and agricultural conditions of the region.

The soils are of two general classes, residual and alluvial. The residual soils are derived from the impure and fossiliferous limestones known as the Lithostrotion bed or St. Louis limestone. They are silty in texture and of a red and gray color. The soils produce an excellent grade of export tobacco.

[Soils of the Yamethin District, Burma], A. McKERRAL ET AL. (*Dept. Agr. Burma, Agr. Surveys*, 1912, No. 3, pp. 32, pl. 1).—Chemical analyses of a large number of samples of the different soil types of the region are reported, and the distribution and agricultural characteristics of the soils are briefly discussed.

[Analyses of Queensland soils], J. C. BRÜNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland]*, 1911-12, pp. 58, 59, 63-72).—Mechanical and chemical analyses of soils from the experimental plats of the state farm and from different districts of the State, and soil moisture determinations at various depths and under different methods of cultivation, are reported.

The soils vary from sandy to stiff clay types. Phosphoric acid is the limiting element of plant food.

The well cultivated soil not only absorbed the rain much more readily, but also held "the moisture much better during spells of dry weather."

Temperature observations in the soil on fallow, grass land, and under field crops, W. NAEGLER (*Nächs. Landw. Ztschr.*, 60 (1912), No. 49, pp. 658, 659).—Observations at Breslau, Germany, on the temperature of the soil to depths of 120 cm. (about 47 in.) and of the air immediately above the soil on loamy clays with sandy subsoil in fallow and grass lands and land growing barley, turnips, and potatoes are reported.

The results in general show that the temperature of the air immediately above the soil was considerably higher for the land growing the different crops than for the fallow land. The temperature of the grass land was lower than that of the cropped land and higher than that of the fallow.

Colloid chemistry in the study of soils, K. K. GEDROITS (*Zhur. Opytn. Agron. [Russ. Jour. Expt. Landw.]*, 13 (1912), No. 3, pp. 363-420, fig. 1).—The author reports a study of (1) the amount of colloidal substances in soil solution, (2) the formation of sodium carbonate in soils, and (3) alkali soils (those containing sodium carbonate) and saline soils (those containing sodium chlorid and sodium sulphate).

The combined organic and mineral colloid content of the soil solution, except in alkali soils, was very small, the amount varying between 0.0018 and 0.02 gm. per 100 gm. of soil. The author therefore questions the correctness

of the theory that the action of freezing, drying, and addition of lime and other fertilizers on the relation of the soil to water and on other physical properties of the soil is due to the coagulation of the sols of the soil solution.

The colloid content of the alkali soils varied between 0.009 and 0.4494 gm. per 100 gm. of soil.

From a study of water extracts of typical alkali soils and of soils to which various salts were added, the author concludes that sodium carbonate is not formed in the soil by direct reaction between sodium chlorid and calcium carbonate, but that the soda of the chlorid replaces other bases (potash, lime, and magnesia) in humates and silicates, and the latter give up soda to the soil solution when the excess of soluble sodium salts is removed. Sodium sulphate to a large extent acts in the same way as sodium chlorid. It results from this that when the proportion of sodium chlorid and sodium sulphate is sufficiently reduced in a saline soil the latter is converted into an alkali or soda soil. Therefore, leaching alone is not likely to be of value in improving alkaline and saline soils, but tends to favor the formation of sodium carbonate.

Regarding the exchange of bases in cultivated soil, G. WIEGNER (*Jour. Londc.*, 60 (1912), Nos. 2, pp. 111-150, pls. 2; 3, pp. 197-222, fig. 1; abs. in *Chem. Zentrbl.*, 1912, II, No. 15, p. 1306; *Chem. Abs.*, 6 (1912), Nos. 17, p. 2477; 22, p. 3304; *Jour. Chem. Soc. [London]*, 102, (1912), No. 690, II, p. 891).—The author reviews in considerable detail the work of others bearing on this subject, and reports a study of the exchange of bases which occurs when molecular equivalents of silicate gels, having an average composition of 42.66 per cent SiO_2 , 0.35 per cent CO_2 , 19.95 per cent Al_2O_3 , 8.68 per cent CaO , 5.47 per cent K_2O , and 22.86 per cent H_2O were shaken up with ammonium chlorid at intervals for 48 hours, the resulting solution being filtered and analyzed.

It was found that there was an absorption of ammonium with an exchange of calcium and potassium ions of the silicate gel in amounts almost exactly equivalent to that of the ammonium absorbed. The anions remained undisturbed as long as there were no secondary reactions. True equilibrium was established at 20° with great rapidity. The influence of temperature upon the equilibrium was very small, rise in temperature causing a slight decrease in absorption. The degree of fineness of the silicate had but little influence upon absorption. Dehydration lessened absorption. The loss of the first 12.6 per cent of water was almost without influence, but with a further loss the ability to absorb rapidly approached zero.

The author considers the reaction a chemical one when regarded as an exchange of equivalents. On the other hand, it showed all the characteristics of a so-called adsorption reaction as interpreted by Freundlich and indicated, in the author's opinion, an adsorption of cations due to electrostatic causes with displacement of an equivalent quantity of cations from the gel.

With various concentrations of the NH_4^+ ions up to saturation, the displacement in the hydrated amorphous silicate gel was in close accord with the equations for adsorption reactions. The most applicable of the adsorption equations is $\frac{x}{m} = B \cdot c^{\frac{1}{p}}$ (in which $\frac{x}{m}$ = the amount of cation adsorbed from 1 gm of substance; c , the concentration of the cation in equilibrium; and B and $\frac{1}{p}$ are constants).

The author also reviews investigations on the exchange of bases in the soil and concludes that the relations are the same for the soil as for the silicate gel used in his experiments. In all experiments in which one kind of cation was used, the value of $\frac{1}{p}$ was approximately 0.4.

The absorption of phosphoric acid through zeolites (permutite), S. GAY ROZTWOROWSKI and G. WIEGNER (*Jour. Landw.*, '60 (1912), No. 3, pp. 223-235; obs. in *Chem. Zentbl.*, 1912, II, No. 15, pp. 1306, 1307; *Chem. Abs.*, 6 (1912), No. 22, pp. 3304, 3305).—There was found to be no absorption of the phosphate ion by potassium permutite from a carefully neutralized solution of monopotassium phosphate. The authors conclude, therefore, from the similarity as to constitution and stability of the potassium permutite and the aluminum hydroxide silicic acid gels of the soil that fixation of phosphoric acid in the soil through the latter must be due in large measure only to secondary reactions with previously exchanged cations which form insoluble phosphates.

The law of minimum, A. MAYER, E. A. MITSCHERLICH, and T. PREIFTER (*Landw. Vers. Stat.*, 78 (1912), No. 1-2, pp. 115-132).—Three controversial articles on the subject. See also a previous note (E. S. R., 27, p. 721).

The law of minimum, H. RODEWALD (*Landw. Vers. Stat.*, 78 (1912), No. 3-4, pp. 247-252).—A continuation of the discussion noted above.

Colloid-chemical investigations of humus substances.—I, Investigation of sphagnum peat, S. ODELL (*Ark. Kemi, Min. och Geol.*, 4 (1912), No. 3, Art. 2, pp. 18). This is a detailed report on a series of researches undertaken with the object of separating the colloidal and noncolloidal substances of sphagnum peat, a brief account of which has already been noted (E. S. R., 27, p. 232). The author's results do not bear out Baumann and Gully's conclusion (E. S. R., 23, p. 715) that all phenomena observed with humus substances may be referred to colloidal action and that humic acids do not exist.

Critical considerations regarding humus acids, humus, and humus soils, H. SÜHRING (*Fühling's Landw. Ztg.*, 61 (1912), No. 14, pp. 465-487).—The author summarizes the present status of information on the character and functions of humus substances in the soil, and gives a critical review of the investigations on this subject by Baumann and Gully (E. S. R., 23, p. 715) and by Tacke and the author (E. S. R., 26, p. 720).

Some experiments regarding the physiological significance of humus substances of the soil, G. A. RITTER (*Internat. Mitt. Bodenk.*, 2 (1912), No. 4, pp. 301-311).—This is a summary of a series of experiments to determine the physiological effect of humus substances on the bacterial activity of the soil, particularly as regards the stimulating effect of the iron in the humus as shown by the work of Remy and Rösing (E. S. R., 25, p. 723).

It is stated that the humus substances of the soil, at least in their purified state, are not strictly sources of food for the soil bacteria. The action of the humus substances was at times stimulating and again retarding. The beneficial action is thought to be due to by-products of the raw humus bodies. The compound which causes the stimulation evidently disappears during the process of purification of the humus acids. The activating substances are insoluble in water.

Decomposition of the nutrient (peptone) solution was increased by additions of large amounts of humus acid, and this lends support to the theory that the iron is the stimulating agent in that it serves as a carrier of oxygen. Denitrification was depressed by increased additions of humus. The biological stimulation is thought to be due to the water insoluble but acid-soluble by-products of the humus substances.

The physiological stimulation was as great from applications of purified humus acids as from relatively large applications of calcium carbonate. The combined application of humus acids and calcium carbonate produced no noteworthy further stimulation over that produced by either the one or the other of these compounds alone. The physiological rôle of the humus acids therefore can not be regarded in the main as that of an acid.

The organic constituents of soils, O. SCHREINER (*U. S. Dept. Agr., Bur. Soils* (Circ. 74, pp. 18).—This is an address given at the symposium on soils at the Washington meeting of the American Association for the Advancement of Science, in which the author discusses the relation of the organic constituents of the soil to plant growth on the basis of investigations reported in detail in bulletins of the Bureau of Soils.

Toxic effects of "alkali salts" in soils on soil bacteria.—III, Nitrogen fixation, C. B. LIPMAN and L. T. SHARP (*Centbl. Bakt. [etc.]*, 2, Abt., 35 (1912), No. 25, pp. 647-655, fig. 1; obs. in *Jour. Chem. Soc. [London]*, 102 (1912), No. 202, 11, p. 1200).—This is the third communication on this subject, previous papers (E. S. R., 27, p. 124) having dealt with the effect of alkali salts on nitrification and ammonification. A modified form of the Gunning method for nitrogen determinations in soils is described and recommended for general use in soil work.

The results show that "sodium chlorid is toxic to nitrogen-fixing organisms in soil at a concentration of 0.5 to 0.6 per cent of the dry weight of the soil; sodium sulphate does not become toxic until a concentration of about 1.25 per cent is reached under similar circumstances; sodium carbonate is the most toxic of the 'alkali salts' tested for nitrogen-fixing organisms, a concentration of 0.4 per cent to 0.5 per cent being sufficient to inhibit nitrogen fixation.

"Unlike their effects on other forms of soil organisms . . . the effects of the 'alkali salts' are relatively only slightly toxic to nitrogen-fixing organisms, but the toxic point manifests itself much more sharply" than it does for ammonifying and nitrifying organisms.

"It would seem possible . . . that, with a sufficient amount of organic matter as a source of energy, nitrogen fixation could go on in soils containing a relatively high salt concentration. . . .

"Sodium chlorid is less toxic for nitrogen-fixing organisms than for either ammonifying or nitrifying bacteria. Sodium sulphate is likewise much less toxic for the first group than for the other two; sodium carbonate is much more toxic for nitrogen-fixing than for ammonifying organisms, but not nearly as toxic as it is to nitrifying organisms.

"While the toxicity of the salts in question does not manifest itself until very considerable concentrations are reached, no stimulating effect has ever been noted at any concentration. . . .

"It would appear that the nitrogen-fixing organisms behave physiologically very much more like alkali-resistant plants than they do like other forms of soil organisms."

Experiment in inoculation of lucern, A. V. DOWNAN (*Agr. Gaz. N. S. Wales*, 22 (1912), No. 11, pp. 953-958).—Preliminary experiments to determine the value of different methods of inoculation of lucern seed and soil, alone and combined with applications of lime and complete fertilizers, are reported. The soil was a well drained, red sandy loam and had been used in a continuous manurial experiment until 1907. Since that time the cropping and fertilizer systems were varied.

It was found that the efficiency of the different methods of inoculation was in the following descending order: "(1) Inoculation of soil with soil of same composition, (2) inoculation by watering soil after germination, (3) inoculation by watering soil before sowing, (4) inoculation of soil with soil of dissimilar composition, (5) seed inoculated with lucern Rhizobia, and (6) seed inoculated with vetch Rhizobia.

"Lime applied to plats caused an enormous increase in the number of plants with nodules, and also increased the number of nodules per plant. Where, how-

ever, no lucern Rhizobia were introduced, the presence of lime caused practically no difference.

"Complete manure did not, on the totals throughout, increase the number of nodules, although an increased growth of both stem and root was caused by its application."

Changes which take place in the soil as a result of plant growth and fertilization, J. G. MASCHHART (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproufstad*, [Netherlands], 1912, No. 12, pp. 48-71, pls. 8).—Pot experiments to determine the effect of growth of plants (potatoes, wheat, and oats) and applications of sodium nitrate, ammonium sulphate, and ammonium nitrate on the rate of settling of the clay particles of a light sandy loam soil when shaken with water are reported, together with a theoretical discussion of the nature of the reaction involved.

The results showed that the clay of the uncropped soils settled most rapidly, that of the cropped soils and of those receiving sodium nitrate settling slowest. The ammonium sulphate soils settled somewhat quicker than those receiving ammonium nitrate.

Cropping with potatoes retarded the rate of settling considerably, and to a greater extent than cropping with wheat and oats. The rate of settling in the cropped ammonium sulphate soil was less marked than that of the uncropped soil.

Cause of harmful effects of fertilizing with mineral compounds on humus sandy soils, J. HIND (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproufstad*, [Netherlands], 1912, No. 12, pp. 83-138, figs. 3).—Previous investigations having shown that the so-called "cat sickness" of the soils of Drenthe and Groningen (E. S. R., 21, p. 115) was due to the continued use of alkaline or physiologically alkaline fertilizers, the author made further studies of the physiological effect of different organic extracts, sugar humus, and pyrogallol on oats grown on moor soil and on pure sand receiving a basal fertilizer to determine the nature of the "sickness." Attempts were made with unsuccessful results to isolate toxic compounds from the organic matter of the soils.

The results of these studies show that the harmful effect of the continued alkaline fertilization was due to the formation of unidentified humus compounds. These compounds exist principally in the alkali insoluble part of the organic matter.

When sugar humus was mixed with sand with addition of lime or soda and sodium nitrate, the sickness developed within a few years. Pyrogallol, with addition of alkali on sand, also produced the disease in a few years.

Tests with commercial fertilizers, W. H. LAWRENCE (*Washington Sta. Bul. 7. spec. ser.*, pp. 106-113).—Experiments with various fertilizer combinations lime, and manure on onions, potatoes, grains, and grasses are reported.

In case of the onions "no visible results of the influence of the fertilizers could be observed." In case of potatoes "all of the fertilizers, with the exception of potash in some cases, increased the yield, even doubling and trebling it. . . . The applications of barnyard manure alone increased the yield in most cases, and in combinations with lime gave slightly greater returns. Lime alone produced slightly better returns than the check plot. Very marked results were obtained, however, in the use of combinations of carriers of potash, nitrogen, and phosphoric acid with and without lime." The results with grains and grasses were inconclusive.

Report on vegetation experiments carried out in 1912, H. G. SÖDERBÄCK (*Meddel. Centralanst. Försökes. Jordbruksområdet*, 1912, No. 71, pp. 19, fig. 2).—This includes accounts of experiments with "nitrate phosphate," a b

product of the manufacture of synthetic nitric acid; with calcium nitrate and lime nitrogen; with radio-active fertilizers, particularly calcium-aluminum silicate; with sodium nitrate and ammonium sulphate; and with granite meal.

The nitrate phosphate, which contained 30 per cent of calcium, 30.5 per cent of phosphoric acid, 23.8 per cent of which was citrate-soluble, and 3.6 per cent of nitrogen, was fully as effective as a source of phosphoric acid as superphosphate. When thoroughly mixed with the soil the calcium nitrate was about as effective as sodium nitrate and ammonium sulphate. The granulated lime nitrogen used was somewhat less effective. The results with the so-called radio-active catalytic fertilizers were inconclusive. The granite meal gave good results as a source of potash. This is attributed to the fact that the potash was largely in the form of mica, which Prianshnikov has shown to be more available than other silicates.

Philippine guano. A. J. Cox (*Philippine Jour. Sci., Sect. A*, 7 (1912), No. 3, pp. 195-199).—Analyses of a large number of samples from different parts of the islands are reported, showing a variation in nitrogen content from almost none to 8.31 per cent, and in phosphoric acid from very small amounts to 23.12 per cent. It is stated that the Philippine guanos "consist of the excreta of sea fowls and other birds, bats, and marine animals, with more or less bone and animal matter furnished by dead bodies, and are found in large quantities in some places, mainly on small islands and in numerous limestone caves. That from caves is usually bat excrement. Deposits of bat guano have been discovered on a great many of the islands, chief among which are Marinduque, Guimaras, Luzon, and Mindoro; and some of these have been located and recorded. The deposits in some of the caves are reported to consist of one or more thousands of tons. Probably as yet not over 1,000 tons of guano have been mined in the whole Archipelago. In a few instances considerable quantities of bat guano have been removed from church towers."

The peat bogs in Michigan: From an agricultural point of view, A. J. PATTEN (*Jour. Amer. Peat Soc.*, 5 (1912), No. 2, pp. 65-69; *Sci. Amer. Sup.*, 74 (1912), No. 1928, p. 383).—This article very briefly discusses peat as a direct fertilizer, as a filler for commercial fertilizers, as a stable litter, and as an agricultural soil. Its use for the first two purposes is condemned. As a litter it is very valuable. Reclaimed peat lands are often very valuable.

New observations on the behavior of nitrate in cultivated soil, II, J. VOGL (*Landw. Vers. Stat.*, 78 (1912), No. 3-4, pp. 265-391; *abx. in Jour. Chem. Soc. [London]*, 102 (1912), No. 691, II, p. 1689; *Chem. Zentrbl.*, 1912, II, No. 26, pp. 2134, 2135; *Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3, (1912), No. 11, pp. 2379, 2389; *Jour. Soc. Chem. Indus.*, 32 (1913), No. 2, p. 100).—Summarizing the results of studies of changes in the soil nitrates reported in this and a previous paper (*E. S. R.*, 27, p. 626), the author maintains that the present conception to the effect that sodium nitrate remains unchanged in soil when uncultivated and protected from washing, is not correct. On the contrary, there are conditions under which a rapid and extensive decomposition of the nitric acid salts of the soil takes place, forming oxides of nitrogen of different kinds, and sometimes probably also nitrogen and ammonia. The processes are, therefore, accompanied by losses of nitrogen.

Such decomposition of nitrates takes place when there is a distribution of the salt in very shallow layers of soil and when a definite water content is maintained for some time. This water content lies between 15 and 20 per cent with average soils, but may be higher or lower according to special conditions. When the water content becomes so high that puddling of the soil results, there is no longer any decomposition of the nitrates.

The decomposition process is purely chemical and presents a typical surface reaction in which colloid-chemical processes probably play a rôle. Micro-organisms are not concerned in the reaction.

The reaction is rapid and may reach its highest point in 3 or 4 days. After the reaction the soil is dry and powdery and settles slowly when washed with water. The reaction took place in all mineral soils used in the experiment irrespective of color and texture. The humus content alone, therefore, can hardly be the causative agent of the reaction.

Nitrate deposits, H. S. GALE (*U. S. Geol. Survey Bul.* 523, pp. 36, pls. 2, figs. 2; *abs. in Amer. Fert.*, 37 (1912), No. 11, pp. 37-44, figs. 2).—The bulletin describes and discusses the origin of the principal nitrate deposits of the world, including also accounts of the known deposits in the United States, none of which is at present of commercial importance.

The nitrate deposits, W. S. MYERS (*Commercial Fert.*, 35 (1912), No. 4, p. 26).—It is stated that "there are probably, in round numbers, 1,000,000,000 tons of nitrate in the deposits of Chile, and, without doubt, large supplies also exist on lands now but incompletely prospected. The surveyed and certified tonnage opened up at the present time ready for extracting is fully 250,000,000 tons."

The ammonia production (*Amer. Fert.*, 38 (1913), No. 1, p. 32).—It is stated that the ammonia production in the United States in 1912 calculated as ammonium sulphate was 155,000 short tons as compared with 127,000 tons in 1911. At the beginning of 1912 there were 4,624 by-product coke ovens in operation in the United States and 638 in process of construction. It is estimated that from 55,000 to 60,000 tons of ammonium sulphate was imported into the United States in 1912 and that the total consumption of this material in that year was from 210,000 to 215,000 tons as against 221,633 tons in 1911.

Fixation of atmospheric nitrogen in nature and in industry, A. KNOX (*Österr. Chem. Ztg.*, 15 (1912), Nos. 17, pp. 226-231; 18, pp. 245-247; *abs. in Chem. Ztg.*, 36 (1912), No. 155, *Repert.*, p. 691).—This is a review of progress in the knowledge of natural chemical fixation of nitrogen, symbiotic and non-symbiotic fixation by micro-organisms, and technical fixation by electrical processes.

Potash from seaweed (*Chem. Trade Jour.*, 51 (1912), No. 1355, p. 646).—Two attempts which are now being made in California to extract potash from seaweed on a commercial scale are briefly described.

Potash in Nebraska (*Amer. Fert.*, 37 (1912), No. 11, p. 54).—A brief account is given of investigations by the U. S. Geological Survey showing that certain of the small shallow alkali lakes occurring in the sand hills of Nebraska contain considerable percentages of potash salts.

Potash in the Permian rocks of Texas, J. A. UDDEN (*Amer. Fert.*, 37 (1912), No. 12, pp. 40, 41).—Analyses of water from a deep well (3,000 ft.) at Spur, Texas, showed the presence of considerable amounts of anhydrite and salt, and indicate "that the general physical conditions prevailing during the formation of the sediments here were like those prevailing in the Stassfurt region when the salt beds were formed there."

Phonolite as a fertilizer from the standpoint of its mineralogical, petrographic nature and chemical properties, E. BLANCK (*Fühling's Landw. Ztg.* 61 (1912), No. 21, pp. 721-731).—The potash in the phonolite is stated to be largely in the form of leucite, with smaller amounts of nepheline and other silicates. The fertilizing action of the phonolite is due mainly to the nepheline and leucite and must necessarily be small as compared with potash salts.

Submarine formation of phosphates (*Rev. Sci. [Paris]*, 50 (1912), II, No. 14, p. 33).—A discussion by Joleaud of the origin and formation of the phosphate deposits of Tunis is briefly reviewed.

The effects of calcium and magnesium carbonates on some biological transformations of nitrogen in soils. W. P. KELLEY (*Univ. Cal. Pub. Agr. Sci.*, 1 (1912), No. 3, pp. 39-49).—The author reviews investigations on the subject by others and reports a preliminary study of the effect of varying amounts of calcium and magnesium carbonates, alone and combined, on ammonification and nitrification of dried blood in two different sandy soils from California.

The results show that "calcium carbonate stimulated the ammonification of dried blood to a limited extent but exercised a more noteworthy stimulating effect on nitrification. With magnesium carbonate a pronounced toxic effect was produced. In the ammonification of dried blood there was sustained a loss of about one-third as compared with the experiments without the use of carbonates, while in the nitrification experiments magnesium carbonate completely inhibited nitrate formation. It is also noteworthy that no evidence of antagonism between calcium and magnesium carbonates was observed."

Manganese as a fertilizer. M. N. SULLIVAN and W. O. ROBINSON (*U. S. Dept. Agr., Bur. Soils Circ.* 75, pp. 3).—The distribution of manganese in soils and its effect upon the growth of plants are briefly discussed.

Of the 26 American soils recently analyzed "all contain manganese (MnO) in proportions ranging from 0.01 to 0.51 per cent. The average content in these soils is 0.20 per cent. or about 8,000 lbs. in the acre-foot."

Experiments abroad with manganese salts as fertilizer are referred to.

Manures. R. H. CARTER and S. J. M. ACLE (*Jour. Southeast. Agr. Col.* Wye, 1911, No. 20, pp. 248-261).—Analyses of miscellaneous fertilizing materials, including wool dust, shoddy and shoddy waste, cloth waste, fur waste, hair waste, fish guano, quail guano, Peruvian guano, bone meal, rape dust, manila waste, rag refuse, cotton-seed waste, and esparto grass dust, are reported and discussed. It is stated that many of these materials are used in large quantities by hop and fruit growers in Kent.

Analyses of commercial fertilizers, 1912 (*New York State Sta. Bul.* 354, pp. 363-482).—The report gives the guaranteed composition and actual analyses of samples collected during the year by the commissioner of agriculture of New York.

Analyses of commercial fertilizers. B. L. HARTWELL ET AL. (*Rhode Island Sta. Insp. Bul.*, 1912, Oct., pp. 8).—Guaranteed and actual analyses and valuations of a part of the fertilizers inspected during 1912 are reported.

Analyses of commercial fertilizers. R. N. BRACKETT ET AL. (*South Carolina Sta. Bul.* 171, pp. 68).—The bulletin reports analyses and valuations of 1,680 samples of fertilizers examined during the season of 1911-12. Explanations of fertilizer terms and provisions of the state fertilizer law, the taking of samples by farmers, and valuation of fertilizers are given.

Fertilizer inspection, 1912. A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul.* 112, pp. 37).—Analyses of 323 samples of fertilizers collected in Canada during April and May, 1912, are reported. "Of this number 287 samples meet the guaranteed value of the brands which they represent, and for which they are sold." One hundred and eight of the brands examined were imported.

AGRICULTURAL BOTANY.

The progress of agricultural bacteriology. I, II. F. LÖNNIS (*Ztschr. vergleich. physiol.*, 1 (1912), Nos. 1, pp. 68-74; 4, pp. 340-370).—Of some 1,200 investigations in agricultural bacteriology published since the appearance of

the author's Handbook of Agricultural Bacteriology in 1910 (E. S. R. 23, p. 720), he has selected those considered most valuable in this connection as the basis of discussion in these two articles. The topics are treated in much the same order as in the handbook, giving in very condensed form a digest of the results and views presented by various authors, including a discussion of the presence and activity of bacteria in food stuffs, milk products, manures, and soils. An extensive bibliography is appended.

On the fungi of the soil, ELIZABETH DALE (*Ann. Mycol.*, 10 (1912), No. 5, pp. 452-477, pls. 6).—A study is reported of the fungus flora of two soils taken from adjacent plots on the Royal Agricultural Society's farm at Woburn. The soil is light and sandy. Twenty genera of fungi were obtained from the samples of soil, and the species are described at some length. Attention is called to the striking resemblance to the fungus flora of North American soils as described by Jensen (E. S. R., 27, p. 728), many of the genera and species being the same as those determined by the author.

The influence of medium on some of the lower fungi, L. RAYBAUD (*Rev. Gen. Bot.*, 24 (1912), No. 286, pp. 392-402).—The results are given of the author's investigations on the effect of light, pressure, vapor tension, osmotic strength of solutions, transpiration, and nutrient media on the growth and sporulation of *Phycomyces nitens* and *Rhizopus nigricans*.

Studies on Azotobacter.—I. Morphology and cytology, A. PRAZMOWSKI (*Bull. Internat. Acad. Sci. Cracovie, Cl. Sci. Math. et Nat., Ser. B.*, 1912, No. 3, pp. 87-117, pls. 8).—The author gives an account of the present state of knowledge concerning the life and activities of *A. chroococcum*; of some investigations and the methods followed; and of the general and special morphology and the general and special cytology of this organism. A bibliography is appended.

Cytological and experimental studies in Citrus, I. OSAWA (*Jour. Col. Agr. Imp. Univ. Tokyo*, 4 (1912), No. 2, pp. 83-116, pls. 5, fig. 1).—The author has investigated the development of pollen grains and embryo sacs in Citrus in general, and studied the irregularities and anomalies occurring in the varieties Unshu and Washington Navel. Among the conclusions given are the following:

In *C. trifoliata*, fertilization appears to take place about 4 weeks after pollination. The primary endosperm nucleus may divide immediately after fertilization, and earlier than the oospore nucleus. The first nuclear division of the oospore appears to take place 3 or 4 weeks after fertilization.

In a study of the fruits the author found that the so-called "navel" at the top of the Washington Navel orange is due to the multiplication of loculi and carpels, and to the protrusion of these new carpels beyond the top of the fruit. In studying the pollen grains he found that in the variety Unshu they are mostly irregularly shaped and sterile. Disintegration of the pollen cells in the Washington Navel orange occurs as early as the sporogenous stage, and no pollen grains are found in the anthers at the time of flowering.

Disintegration of the embryo sacs sometimes takes place in the variety studied. As normal embryo sacs are produced in Unshu and Washington Navel they may produce a few seeds if pollinated with good pollen grains from fertile species of Citrus. The small number of seeds in many cases is evidently due to the frequent disintegration of the embryo sacs. Seedless fruits in Citrus are produced, chiefly owing to the lack of fertility of pollen grains and partially to the frequent disintegration of the embryo sacs.

Cytological investigations on the formation of starch and plastids in plant A. GUILLERMOND (*Arch. Anat. Microsc.*, 13 (1912), No. 3, pp. 309-428, pls. 6, fig. 11).—A report is given on the method of formation of starch and the origin of plastids in plants.

The author concludes that starch is not formed in the chloroplasts but is always a product of the leucoplasts, which, on account of their minuteness, are difficult of demonstration. The leucoplasts, chloroplasts, and chromoplasts of phanerogams have a mitochondrial origin. From a chemical-histological examination, these plastids present the same coloration as mitochondria and are not distinguished except by their resistance to acetic acid and alcohol. The author considers that from their behavior the mitochondria and the plastids are apparently formed of very similar materials, and he believes that the plastids like the mitochondria differentiate for a special function. The mitochondria, he claims, are incapable of forming themselves except by the division of pre-existing ones, which are transmitted from the mother plant to the egg and from the egg to the embryo and the adult plant. He thinks that the mitochondria in plants not only serve as the generators of the plastids, but that they perform an important rôle in the elaboration of the products of secretion and in the differentiation of the cell.

A bibliography is appended.

Structure of the starch grain. M. W. BEIDERINCK (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 14 (1912), pt. 2, pp. 1107-1110, fig. 1).—The author states that if a quantity of starch is boiled with sufficient water to bring the grains to their maximum of swelling, and a strong tannin solution be made to flow sideways under a cover glass, the grains, which before seemed homogeneous as to structure, now show a very distinct membrane through which the tannin easily diffuses to the inside where it forms a characteristic precipitate. With a dilute solution, this precipitate is seen to consist of little droplets in very lively Brownian movement; with a more concentrated solution it consists of solid particles adhering together and filling the whole inner space of the vesicle.

The author thinks that there can be no doubt that the boiled starch grain consists of a solid but very soft sac-shaped closed wall containing a liquid. The latter is supposed to be a granulose or amylose solution, containing 0.6 of the substance of the starch originally used, the wall containing the remaining 0.4. These sacs can be burst and the contents freed by rubbing the boiled starch with fine sand; or the contents may be dissolved out through the envelopes by constantly renewing the water for some days. The vesicles, freed from their contents, when treated with iodine take a somewhat violet color, rather lighter than does the granulose solution. When preserved they become partly soluble in water containing chloroform. By leucodiastase they are easily converted into maltose and dextrose quite like granulose.

A study on the maturation of fruits. A. CONTINO (*Staz. Sper. Agr. Ital.*, 45 (1912), No. 5-6, pp. 460-472).—The author gives the results of analyses made of ripening Japanese persimmons along with which the bearings of the figures obtained upon hypothetical reactions are considered. The tannin compounds are said to disappear almost entirely. The sugars are said to be represented in the ripe fruits by levulose and dextrose, the latter predominating and saccharose being absent. The extension of these researches to other fruits is promised.

The variation of fat, sugar, and saponin during the maturity of seeds of *Lychnis githago*. MARIE KORSKOFF (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 23, pp. 1162-1164).—Studies were made of the seeds of corn cockle at different stages of development to determine the variation of some of their constituents.

The proportion of substances soluble in ether diminished from the youngest stages of the seed toward maturity, as did the sugar content, while the saponin content, on the contrary, increased with the development of the seed, the very

young seeds hardly showing a trace of this glucosid while the mature ones contained it in considerable quantity. As saponin exists only in very small quantity in other portions of the plant it is thought that it probably is formed in the seed. The progressive disappearance of sugars and accumulation of saponin indicates that there is a relation between these two phenomena and that the presence of the glucosid depends upon the sugar formed in other portions of the plant.

Assimilation of nitrates and nitrites, IV, O. BAUDISCH (*Ber. Deut. Chem. Gesell.*, 45 (1912), No. 13, pp. 2879-2883).—This is in pursuance of former conclusions (*E. S. R.*, 27, p. 226) and in reply to a physiological criticism by O. Loew (*E. S. R.*, 27, p. 332).

The influence of the acidity of green plants on the utilization of insoluble phosphates, G. CORSO (*Ann. R. Staz. Chim. Agr. Sper. Roma*, 2. ser., 5 (1911), pp. 123-132).—Already noted from another source (*E. S. R.*, 26, p. 321).

Influence of phosphate on the toxic action of coumarin, J. J. SKINNER (*Biol. Gaz.*, 54 (1912), No. 3, pp. 245-249).—In a previous paper (*E. S. R.*, 27, p. 520) attention was called to the fact that phosphate in nutrient solutions was able to overcome the toxic effect of coumarin on wheat seedlings. In these experiments monocalcium phosphate was used, and the possibility of the calcium being the neutralizing agent has been considered. Experiments are therefore reported in which monosodium, disodium, and trisodium phosphates were employed, from which the conclusion is drawn that the peculiar action of phosphate salts in overcoming the toxic effect of coumarin is due to the phosphate radical and not to the presence of any particular base, or to the acid or alkaline reaction of the nutrient solution.

The presence of arsenic in the plant kingdom, F. JADIN and A. ASTARC (*Jour. Pharm. et Chim.*, 7. ser., 6 (1912), No. 12, pp. 529-535).—Analyses are reported showing the arsenic content of 85 species of plants, representing about 30 families of flowering plants and mushrooms.

From the results obtained the author considers arsenic to be quite generally distributed throughout the vegetable kingdom. In a study of such plants as mistletoe, where there is no connection between the plant and the soil, arsenic was found present, and there appeared to be no relation between the arsenic content of the parasite and that of its host plant. In general, the proportion of arsenic to dry matter was considered the best means of comparing the mineral content of the different species. Except in isolated cases, the arsenic found in a certain species gave no indication of that to be expected in other members of the same plant family. The chlorophyll-bearing parts of plants always gave a higher arsenic content than any other portion.

The author believes that the arsenic normally present in animal organs comes from plants which the animals have eaten.

The behavior of plants toward lithium salts, C. RAVENNA and A. MARGINI (*Atti R. Acad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 21 (1912), II, No. 5, pp. 292-298).—In continuation of studies previously noted (*E. S. R.*, 23, p. 723), the authors investigated the effects of lithium sulphate on the development of plants in pure white sand supplied with a complete nutritive solution, such solution with an addition of 0.2 per cent lithium sulphate, and the same solution with the potassium salt replaced entirely by lithium sulphate. In July or August the plants, then three or four months old, were analyzed and lithium was found to have acted injuriously on practically all tested. ^{See} beans, tomato, white mustard, hemp, sunflower, flax, vetch, and Indian corn taken in order, exhibited the injury in decreasing degree. In most cases the difference between the effects of the second and those of the third solution was marked.

Experiments on Kentucky tobacco supplied with varying amounts and proportions of potassium and lithium salt appear to show that tobacco is able to utilize certain small proportions of lithium salts.

The effects produced by metallic salts on yeasts and other fungi, T. BOKORNY (*Centbl. Bakt. [etc.]*, 2. Abt., 35 (1912), No. 6-10, pp. 118-197).—The author gives a report of numerous experiments made by him to determine the nutritive or deleterious effects exerted by about 50 metallic salts on yeast and other fungi along with other lower forms. The detailed results are tabulated.

It was found that the ordinary nutritive salts, monocalcium phosphate and magnesium sulphate, may without injury be supplied to yeast in very much higher concentrations than its composition requires. It is not apparent that every salt acts as poison at all concentrations above a certain point. Enzymes as well as plasma may be poisoned by certain metals. Apparently there exists a close dependence between enzymes and protoplasm. Only 3 metals, copper, mercury, and silver, were found to be injurious until a very high dilution of their salts was reached.

The physiological action of some neutral salts of alkalis and alkaline earths on green plants, T. BOKORNY (*Biochem. Ztschr.*, 43 (1912), No. 5-6, pp. 453-477; *abs. in Jour. Chem. Soc. [London]*, 192 (1912), No. 690, II, p. 975).—Continuing the above work, the action of several neutral salts of alkalis and alkaline earths on various higher and lower plants was investigated.

It was found that calcium nitrate has a more favorable effect on *Spirogyra* than any other salt, and that it also favors the growth of seedlings of various common cultivated plants. Rubidium sulphate at 2 per cent is also highly favorable in case of these latter plants, but is harmful at 5 per cent. Cesium sulphate at 0.01 per cent is favorable to barley, while higher concentrations are less so or are injurious. Lithium sulphate in solutions of from 0.005 to 0.01 per cent acts favorably on growth. Other salts tested were less favorable than the first two named.

The influence of potassium, rubidium, and cesium on the development and the sporulation of *Aspergillus niger*, B. SAUTON (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 23, pp. 1181-1183).—The author reports that the substitution of rubidium for potassium diminished the growth of the fungus by at least 50 per cent. Cesium proved not adapted as a nutrient for *A. niger*, while potassium exercised a decided influence on the formation of spores. When rubidium or cesium was substituted for potassium no spores were formed.

Absorption of barium chlorid by *Aragallus lamberti*, C. D. MARSH (*Bot. Gaz.*, 53 (1912), No. 3, pp. 250-252).—A brief account is given of investigations to determine the absorption of barium chlorid by *A. lamberti*.

A preliminary experiment showed that growing plants were injured when watered with a 10 per cent solution, but subsequent experiments with 0.1 and 1 per cent solutions showed that the plants endured barium chlorid solution as strong as 1 per cent without bad effect. The plants in the different experiments were analyzed, and the largest barium content was found in those treated with the strongest solutions. In other words, it appeared that the quantity of barium salt absorbed varied directly with the amount in the soil.

The effect of some aromatic substances on the formation of cyanogen in plants, C. RAVENNA and G. ROSINELLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 21 (1912), II, No. 5, pp. 236-292).—The authors investigated the effect on the production of cyanogen by *Sorghum vulgare* of the introduction into the stalk of benzole, salicylic, or phthalic acids or of pyrostechin, resorcin, hydrochinon, or pyrogallol.

The tabulated results of these experiments show that all the plants so treated produced less hydrocyanic acid than did the controls. The lowering was con-

siderable in case of benzoic and phthalic acids and hydroquinon, which were administered in the larger proportions.

Effect of solanin on the potato plant. J. J. SKINNER (*Plant World*, 16 (1912), No. 11, pp. 253-256, fig. 1).—Experiments in growing potatoes in culture solutions containing solanin showed that although solanin is a constituent of potatoes it is harmful to the growth of the potato plant when present in culture solutions.

The association of tannin with an emulsion colloid in the acorn. F. F. LLOYD (*Johns Hopkins Univ. Circ., n. ser.*, 1912, No. 2, pp. 15-18).—A summary is given of a lecture delivered before the department of botany of the Johns Hopkins University, in which it is shown that the tannin in the idioblasts of the acorn occurs in association with a second colloid. This is held to be an emulsion colloid, and not a protein but a mucilage-like substance. This theory is in conformity with that previously described (*E. S. R.*, 27, p. 228).

The resistance offered by leaves to transpirational water loss. B. E. LIVINGSTON (*Johns Hopkins Univ. Circ., n. ser.*, 1912, No. 2, pp. 11-13).—A description is given of an application of Stahl's test with cobalt chlorid for determining the water loss by transpiration.

It was shown by this method that the water-withholding power of ordinary leaves is much greater at certain hours of the day than at others. The cobalt test also brings out the marked increase in the power to withhold water as leaves advance in age. It is easy to compare the resistance offered to water loss by the foliage of different plant forms, and the author claims that the study of the relative drought-resisting powers of different varieties of plants would be facilitated by this method.

The respiration changes in separated foliage leaves. N. T. DELEANO (*Jahrb. Wiss. Bot. [Pringsheim]*, 51 (1912), No. 5, pp. 541-592, figs. 2).—Experiments carried out by the author on detached grape leaves are thought to show that during about the first 100 hours only carbohydrate (starch) is converted, forming carbon dioxide, nitrogenous bodies remaining unchanged. After this period the starch having disappeared, the character of the respiration process apparently undergoes a change, coagulable proteins being changed into soluble products, among others into ammonium salts; but no nitrogen escapes from the leaf. The ash content, which increases somewhat during the first period, decreases during the second.

It is inferred that leaves on the plant normally employ only carbohydrates in respiration, but that in case of exhaustion of this supply they are able to carry on that process by use of nitrogenous bodies. See also a previous note (*E. S. R.*, 26, p. 822).

The action of the respiratory enzymes of *Sauromatum venosum*. T. WELLES (*K. Akad. Wetensch. Amsterdam. Proc. Sect. Sci.*, 14 (1911), pt. 1, pp. 376-377).—The author summarizes his experiments as follows:

"By pressing out and precipitating the press juice with alcohol or acetone there can be obtained from the spadix of *S. venosum* a crude enzyme that decomposes glucose with the formation of carbonic and organic acids, but without the production of alcohol either in the air or in a hydrogen atmosphere. Destruction of the cellular structure and treatment with alcohol or acetone do not therefore inactivate the respiratory enzymes in the present case, their power of decomposing sugar remaining very marked.

"In the same way a crude enzyme is obtained from the leaves of *Sauromatum* which is similar but has a weaker action.

"In the ether extract of the acid liquid citric acid was demonstrated, while acid very probably must be formed by the respiratory enzymes at the expense of the glucose."

The photochemical synthesis of carbohydrates under the influence of ultraviolet rays, J. STOKLASA, J. ŠEBOR, and W. ZDOBNIČKÝ (*Biochem. Ztschr.*, 41 (1912), No. 5, pp. 333-372, fig. 1).—Continuing previous work (E. S. R., 26, p. 430), the results of which are said to be supported by those of A. J. Kluyver (E. S. R., 27, p. 827), the authors report further investigations, from which they conclude that under the influence of ultraviolet rays on formaldehyde in the presence of carbohydrates with access of air or oxygen, the direct formation of carbon dioxide or water does not occur, but that the formaldehyde appears as a source of formic acid, which under the conditions of its formation develops carbon dioxide and water. Hexoses form under such conditions upon the addition of ferrous compounds, with or without potassium bicarbonate. It is suggested that in the changes resulting in the formation of carbon dioxide or water there is a reversal of the process of photochemical assimilation of carbon dioxide which takes place in the chlorophyll containing cell. Details are given of these and related hypothetical changes.

The influence of radioactivity on the development of plant organisms, J. STOKLASA (*Österr. Chem. Ztg.*, 15 (1912), No. 22, pp. 301-303).—The above work has been extended to the influence of radium emanations, which show some suggestive analogies. It was found that, while in certain strengths and durations either no effect or injurious effects were produced on sprouting seeds or growing plants, under different conditions growth was favored with synthesis of sugar, the character of which is still under investigation.

Investigation of the transmission of light stimuli in the seedlings of *Avena*, P. C. VAN DER WOLK (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci.*, 14 (1911), pt. 1, pp. 327-342).—A preliminary report of his investigations.

"To sum up, we have been able to analyze the process of phototropic stimulation into the primary electro-physiological perception process which causes the remarkable polar division of sensitiveness between the apex and the base and by this means has become the actual cause of the irreversibility of the phototropic curvature effect and in addition, secondarily, the photochemical process which brings about the curvature. Possibly we may be able to refer the decrease of the phototropic curvature effect by means of greater quantities of energy, as also rectipetality, to the origin of polarization currents, to which the polar accumulations of ions in their turn give rise."

The influence of light on the transpiration of green leaves and those without chlorophyll, LACLERC DU SABLON (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 18, pp. 847-849).—As a result of previous investigations (E. S. R., 26, p. 430), the author has come to the conclusion that increase in transpiration of succulent plants is not due to the action of sunlight on the chlorophyll but rather to an increased permeability of the protoplasmic membrane.

The effect of direct sunlight, diffused light, and darkness on variegated and isolated leaves has been studied, and the transpiration of green, variegated, and etiolated leaves found to be about equally affected by the different degrees of illumination. Leaves that were variegated, as well as those that were completely colorless, transpired more in direct sunlight and in diffused light than in darkness, and this is held to indicate that transpiration is due to permeability of the protoplasmic membrane and not to the presence of chlorophyll.

A historical sketch of the application of electricity to the stimulation of plant growth, P. EHRENBERG (*Fühling's Landw. Ztg.*, 61 (1912), No. 21, pp. 733-739, figs. 2).—A historical note on the application of electricity as a means for stimulating plant growth is given, in which an account is presented of experiments made by Bertholon in 1783. Some earlier work is briefly mentioned.

Are constant currents of electricity in soil injurious to plants, and why? **E. SCHNECKENBACH** (*Elektrochem. Ztschr.*, 19 (1912), No. 6, pp. 151-154).—The author states that the results of numerous experiments with electrical currents on grasses, grains, legumes, forest trees, mosses, algae, and fungi, continued since 1907, lead to the general conclusion that a constant current is in very different degrees injurious to both the germination and the development of plants. This influence, more or less strong elsewhere, is most marked in the region immediately between the electrodes. Tension, current strength, and duration are factors in the degree of injury, as also are conductivity of soil, form, size, and interval of the electrodes; position of plant or part with respect to the electrodes; warmth, moisture, and light; and chemical composition of the soil. Electrolysis is held to play an important part, the soil or its surface layer acting in a degree as a semipermeable membrane in relation to the water and other constituents of the soil and plant.

Studies in Nicotiana, I. **W. A. SETHELL** (*Univ. Cal. Publ. Bot.*, 5 (1912), No. 1, pp. 86, pls. 28).—This is the first of a series of publications designed by the author to give the results of the work of himself and others in connection with experiments with Nicotiana at the botanical garden of the University of California. The present paper is largely a study of the systematic and morphological relations of the plants that have been brought together, about 17 species with numerous varieties being described.

Quantitative studies of inheritance in Nicotiana hybrids, **T. H. GOODRICH** (*Univ. Cal. Publ. Bot.*, 5 (1912), No. 2, pp. 37-168, pls. 6).—In this publication the author gives an account of studies on the relation between the weights of hybrid tobacco seed and the inheritance of certain characters in the F₂ generation, and on the quantitative expression of imperfect dominance in the corolla diameters of the flowers on the hybrids produced from 3 varieties of *N. acuminata*.

The cultural bud mutation of *Solanum immitis*, **E. HECKEL** (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 18, pp. 801-806).—In continuation of studies on the mutation of species of *Solanum* (*V. S. R.*, 27, p. 230), the author gives an account of his experiments with *S. immitis*, which by the excessive application of fertilizers produced in a single year mutations that resembled some of the cultural forms of *S. tuberosum*. This is thought to be of striking importance on account of the suddenness of the appearance of the mutants.

Experiments with *S. janssii* which have been carried on for 3 years have shown only a slight change in color of the tubers.

The origin of the cultivated varieties of the potato, **E. HECKEL** (*Rev. Sci. [Paris]*, 50 (1912), 11, No. 21, pp. 631-636).—The author summarizes recent experiments and investigations on bud mutations in potatoes as shown by the cultivation of wild tubers of *Solanum commersonii*, *S. maglia*, and *S. tuberosum*.

The results of experiments in bud mutation of *Solanum maglia* and *S. tuberosum*, **C. VERNE** (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 16, pp. 505-509; *Bul. Soc. Nat. Agr. France*, 72 (1912), No. 8, pp. 698-716, pl. 1, figs. 3).—An account is given of cultural experiments with tubers of *S. maglia* and *S. tuberosum* collected in a wild state in parts of South America. The method followed was that of abundant application of fertilizers described by Heckel (see above). A single season's work has resulted in the production of larger tubers than the wild specimens, but the general characters of long stolons, color, and habit have not been greatly changed, though there are apparently some indications of the disturbance of the equilibrium of the species.

Proceedings of the Scientific Society of Brünn (*Verhandl. Naturf. Ver. Brünn*, 39 (1910), pp. XXI+363, pls. 15, figs. 10).—In addition to the usual routine report of the society, the present volume gives an account of the

veiling of a monument to Gregor Mendel and also presents a number of papers relating to various phases of plant and animal breeding. Three original papers of Mendel's are reprinted, their titles being: Experiments on Plant Hybridization. Artificial Fertilization of Hieracium hybrids, and The Tornado of October 13, 1870. Other titles are as follows: Mendel's Law and the Transmission of Acquired Characters, by P. Kammerer; The Adaptation of *Antholyza bicolor* for Fertilization by Birds, by O. Porsch; The Transmission of Morphological Characteristics in *Hordeum distichum nutans*, by C. Fruwirth; A Case of Factor Coupling in *Antirrhinum majus*, by E. Baur; The Spontaneous Omission of Color Factors in Oats, by H. Nilsson-Ehle; Defective Inheritance Ratios in Bursa Hybrids, by G. H. Shull; The Inheritance of Time of Flowering in Peas, by E. von Tschermak; Mendelian Characters in Plants, Animals, and Man, by C. C. Hurst; Heredity in Mice, by L. Cuénot; The Interrelation of Genetic and Nongenetic Factors in Development, by A. L. Hagedoorn; Somatic Inheritance in the Light of Hybrid and Variety Breeding, by R. Semon; Albinism in Inbreeding, by H. Przibram; The Inheritance of Blastogenic and Somatogenic Characters, by W. Roux; Gametic Series Involving Reduplication of Certain Terms, by W. Bateson and R. C. Punnett; and The Mendel Monument and Its Unveiling, by H. Illis.

FIELD CROPS.

[Culture and variety tests of field and forage crops], W. H. LAWRENCE (Washington Sta. Bul. 7, spec. ser., pp. 14-59, 112, 113, figs. 25).—This report presents the results of culture and variety tests secured from 1908 to 1910 on different types of soil of a long list of crops grown for grain production, forage purposes, and soil protection and improvement. In some instances, fertilizer treatment was also given.

Thousand-headed kale proved to be a desirable forage crop, although subject to injury through alternate freezing and thawing, and also susceptible to root rot. In 1909, a yield at the rate of about 1,800 lbs. of seed per acre was secured. Marrow cabbage was found adapted to a wider range of soils than the kale, being more thrifty on tenacious and sticky upland clays. On a small scale, a large yield of seed of good quality was produced. Dwarf Essex rape gave poor results owing to attacks of aphids. A Chinese rape, B. P. I. No. 2462, yielded seed at the rate of 2,772 lbs. per acre and was not subject to insect attacks. Plant lice and club root also interfered with the growth of turnips and ruta-bagas. The cost of growing the largest yielding varieties of ruta-bagas is reported as having varied from \$2.35 to \$3.35 per ton.

Some very heavy yields were recorded for mangels grown on muck soil. Mammoth Golden Giant, yielding 77.4 tons of material per acre, produced roots at a cost of \$1.94 per ton. Transplanting proved a failure when it was done before the tap roots were well formed and strong and from 4 to 6 in. long. Plants transplanted from a hot bed were stronger and more productive than plants transplanted from cold frames, and in this connection young plants were also benefited by the removal of two-thirds of the leaf surface. Of 6 varieties of carrots, St. Vallery and White Belgian ranked first in yield with 23.81 and 21.40 tons of tops and roots per acre respectively. In a test of 32 varieties, Sutton Matchless White stood first with a yield of 43.85 tons of roots per acre, the cost of production being \$3.61 per ton. Seed from selected plants gave the best results. In 1909, red Jerusalem artichokes yielded at the rate of 20.26 tons per acre and in 1910 the white variety on sandy soil produced at the rate of 38.9 tons per acre.

The results of an extensive variety test of corn showed that the varieties from North Dakota and Minnesota were in general the most promising. In-

different returns were secured from Jerusalem corn, Kafir corn, broom corn, Primitive Husk corn, Giant Cuzo corn, branching Doura, sugar cane, and yellow milo maize.

Twenty varieties of oats were tested in 1909 and 1910 on sandy soils. The first year the Red oat led with a yield of 86.3 bu. per acre and the second year a variety designated as No. 12143 ranked first with a yield of 119.2 bu. In 1910, much higher yields were obtained on sandy than on shot-clay soil. The varieties in general ripened earlier on the clay than on the sandy soil, variety No. 143 ripening 9 days and the Red oat 33 days earlier. Winter oats did not prove a success.

Of a number of varieties of wheat, mostly hybrids grown in 1910, the largest yield, 18.5 bu. per acre, was secured from a cross between Turkey Red and Blue Stem. The strongest standing variety was a cross between Red Russian and Jones Winter Life, which gave a yield of 45.5 bu. per acre.

Rye appeared to give better yields on sandy soil than on the clay lands. In 1910, the yields of 4 varieties on sandy soil ranged from 34.2 to 50.6 bu. per acre, while on the shot-clay soil the range was from 11.1 to 18.8 bu. Several varieties sown on upland clay during the early spring failed to mature properly.

In 1909, the yields of 6 varieties of barley ranged from 16.6 to 36.6 bu. per acre, the highest yielding sort being Beardlegs, which also ranked first in the production of straw with 3.28 tons per acre. In 1910, this same variety produced 60 bu. of grain per acre.

The additional forage crop work undertaken included a comparison of 13 different grasses of which meadow fescue ranked first in yield with 4.72 tons of hay per acre in 1909, and timothy with 6.96 tons of hay per acre in 1910. Tall meadow oat grass grew with especial rapidity and made an early spring growth. Brief notes are given on the behavior of awnless brome grass, English rye grass, and Italian rye grass. In 1910, 8 varieties of field peas produced yields ranging from 30.2 to 45.5 bu. per acre, the leading variety being White Seeded Golden Vine. In 1909, White Canadian produced at the rate of 72.6 bu. per acre. The results showed in general that better crops of peas were produced on the shot-clay than on the more porous soils. *Lathyrus articulatus* and *L. echinus* appeared best adapted to a sandy soil and examinations of their roots showed an enormous supply of large nodules. The Tangier pea (*L. tingitanus*) gave great variations in yield but gave also good promise. On clay loam soil it produced at the rate of only 14 bu. of grain per acre, while on a residual clay the yield was at the rate of 72.5 bu. A wide range in yield was also observed in *Vicia ervilia* and *V. sativa*. The highest yield of grain per acre, 37.7 bu., was secured from *V. ervilia* and the second best yield among the different species was 32 bu. per acre from *V. atropurpurea*. Brief notes are given on hairy vetch, native vetch, Egyptian lentil, cowpeas, and horse beans.

Report of the agronomist, T. S. Parsons (*Wyoming Sta. Rpt. 1912, pp. 39-45*). Of 2 varieties of winter wheat tested Turkey Red appeared well adapted to the conditions, and of 8 varieties of spring wheat, John Brown, a recently introduced Australian wheat, and Defiance gave the best results yielding 32.33 and 32 bu. per acre respectively. Winter emmer did not survive the winter, while winter rye gave good results. In a test of varieties of oats, home-grown seed gave much better yields than imported seed. All varieties of barley gave good results, 2 newly tested sorts, California Feed and Hanna, ranking first in yield.

General notes are given on work with alfalfa, field peas, potatoes, root crops, combinations of grass seeds for permanent pasture and meadows, and forage crop mixtures of grains, peas, and other legumes. Irrigation and fertilizer experiments are briefly noted. Dry farming results with flax, spring and winter

ire, potatoes, and forage crops are reported and the yields of 16 varieties of oats, 6 of wheat, 8 of barley and of rye, spelt, millet, oats and peas, field beets, and sugar beets grown at the Wheatland demonstration farm are tabulated.

Crop calendar and manual of agricultural information for the Yaqui Valley, Sonora, Mexico, as determined by experiments previous to July 1, 1911 (*Yaqui Valley [Mexico] Expt. Sta. Bul. 1, 1911, pp. 12, pl. 1*).—This bulletin gives the results of testing varieties of crops to determine those suitable to that locality under various cultural treatments. The tropical and semitropical crops, including wheat, corn, chick pea (garvanzo), beans, alfalfa, rice, cotton, truck crops, sorghum, citrus fruits, garden fruits, dates, and grapes, grew well, while northern varieties of berries and deciduous fruits were not adapted to the conditions.

The results are tabulated.

The application of electricity in agriculture, J. W. PRINSELY (*Trans. and Jour. Proc. Dumfriesshire and Galloway Nat. Hist. and Antiquarian Soc., 24 (1911-12), pp. 140-143*).—This paper is a revision of a brief report by the *Dumfriesshire and Galloway Standard* of a lecture which gave a history of the subject with some results of experiments. Wheat, when electrified, showed an increase of 29 per cent; mangels, 18 per cent; and strawberries, 25 per cent.

Manuring experiments, E. KINCH, D. TURNER ET AL. (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 9-21*).—The experiments reported have a special bearing on the use of sulphate of ammonia in the production of swedes, mangolds, and oats on 7 farms in Gloucestershire.

Grass land (1888-1911): Manurial experiments on permanent grass, E. KINCH and R. G. STAPLEDON (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 1-8, pls. 2*).—Results are reported of manurial experiments on permanent grass plots, some of which have had similar treatment for over 20 years.

The effect of the drought of 1911 on Cotswold grass land, R. G. STAPLEDON (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester, 1911, No. 3, pp. 34-43*).—This article is a partial report of an investigation in regard to the effect of drought (E. S. R., 27, p. 510) upon the botanical composition of the grasses from several Cotswold pastures and hay fields.

Bromus erectus showed high drought-resisting qualities in a 25 cwt. per acre yield of hay in a field that consisted of 45 per cent *B. erectus* as compared with a field of 5 cwt. with only 6.6 per cent of the same grass. *Poa trivialis* is reported to have shown great recuperative powers. It advanced from the merest trace to 17 per cent of the total herbage on one field four months after the drought. *Festuca ovina* on thin soil withstood the drought well, giving 21 per cent of the meager hay crop of the field.

An example of intensive farming in the cotton belt, M. A. CROSBY (*U. S. Dept. Agr., Farmers' Bul. 519, pp. 13, figs. 7*).—This gives the results secured on a 2-acre farm in Alabama, and describes the conditions under which the farm was begun, the method of soil improvement and crop rotation, and the income of the farm as carried on under intensive cultivation. One of the principal aims of the system of farm management pursued was the incorporation of liberal amounts of organic matter in the soil as the chief factor in maintaining and increasing fertility.

Some new alfalfa varieties for pastures, G. W. OLIVER (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 258, pp. 39, pls. 11*).—The author notes the discovery of many new varieties of alfalfa in North Africa, from which seeds have been secured, and further work by crossbreeding and vegetative propagation that has been carried on. Special stress is laid on the rhizome-forming alfalfas for pastures. Detailed descriptions of 16 crosses are given.

"Some of the plants have revealed underground rhizome-forming characters which seem to be correlated with drought and cold resistance. Modifications of these characters have been found in some of the cultivated strains, such as the Grimm, Baltic, Turkestan, and Mongolian alfalfa. In the more tender alfalfas, such as the Peruvian, these characters seem to be absent."

Many crosses were made between recently discovered rhizome-forming alfalfas and some of the standard varieties to provide pasturage forms suited to certain localities.

Viable Bermuda grass seed produced in the locality of Raleigh, N. C. O. I. THILMAN (*Jour. Elisha Mitchell Sci. Soc.*, 28 (1912), No. 2, p. 95).—This article relates to the discovery of seeds of Bermuda grass (*Cynodon dactylon*), near Raleigh, N. C., which, when tested, showed 82 per cent and 60 per cent germination against 27 per cent and 17 per cent from samples of commercial seed.

The analysis of characters in corn and their behavior in transmission. W. B. GERNERT (*Champaign, Ill.*, 1912, pp. 58, figs. 2).—The work, of which this paper is a partial report, has been a search for characters in the corn plant throughout its entire period of growth to discover how many and what they are, and how they behave in transmission. Data have been collected from a large number of publications and an extended bibliography is attached.

Cultural experiments with green fodder corn, WACKER (*Fühling's Landw. Zig.*, 61 (1912), No. 22, pp. 745-762).—In a comparison of yields in a 3-year experiment United States corn (maize) produced 35.4 tons, Natal corn 34.2 tons, and European varieties only 27 tons per acre of green fodder. A result of a test of 16 varieties of corn from domestic and foreign sources is also reported.

Variety test of corn and cotton, 1912, J. M. KIMBROUGH (*Georgia Sta. Circ.*, 68, pp. 3).—This circular gives the yields in bushels of shelled corn per acre, percentage of grain, and number of ears per bushel of 16 varieties; also the results with 25 varieties of cotton, giving pounds of seed cotton per acre, percentage of lint per acre, and number of bolls per pound of seed cotton.

The kaoliangs: A new group of grain sorghums, C. R. BALL (*U. S. Dept. Agr., Bur. Plant Indus. Bul.*, 253, pp. 64, pls. 2, figs. 15).—This bulletin discusses the distribution, culture, and uses of the kaoliangs in eastern Asia, gives the history of their introduction into the United States, and reports the results of testing the varieties introduced. Descriptions of the plant and seed characters of all the introductions and a description of the group as a whole are presented and 27 distinct varieties are named and described for the first time with complete keys for their separation.

It is pointed out that the kaoliangs are good grain producers but of little value for forage on account of their scanty foliage. The earliest variety Manchu Brown was found to mature in from 85 to 95 days in the southern Plains area, and in from 100 to 110 days in South Dakota. Of 9 strains thoroughly tested at Amarillo, Tex., from 1908 to 1911, inclusive, 4 produced average yields of more than 20 bu. per acre and the other 5 produced from 13.8 to 18.8 bu. per acre. The average yield for the 9 strains was 19.7 bu. for the 4-year period, while the average yields of corn varieties under the same conditions were less than 5 bu. At Highmore, S. Dak., strains of Manchu Brown produced an average yield of 13.7 bu. for the 3 years 1909 to 1911.

Variety experiment with oats, D. TURNER (*Ann. Sci. Bul. Roy. Agr. Col. Cirencester*, 1911, No. 3, p. 44).—The results of a test with 17 varieties of oats are given in tabular form.

[Potato experiments], W. H. LAWRENCE (*Washington Sta. Bul.*, 7, spec. ser., pp. 61-73, 108-112, figs. 3).—Tests were made in 1908, 1909, and 1910 with 84

varieties of potatoes but the yields secured, which are given in a table, are quite variable owing to seasonal conditions and the attacks of diseases and insects. Seed potatoes taken from weak hills were low in vitality and produced only small and irregular tubers. Seed tubers exposed to the sun and air for some time before planting did not give results showing definitely that the treatment had been beneficial. A table is given showing the comparative susceptibility to dry rot of the 84 varieties. The starch content and cooking and keeping qualities of the entire list is also shown in tabular form. Notes are given on the selection of seed potatoes, susceptibility to diseases, and elimination of dry rot. Varieties are enumerated with reference to drought resistance, insect attacks, and ripening period. Experiments begun with seedling potatoes are briefly mentioned, and tabular data are given on fertilizer trials from which definite conclusions could not be drawn.

Electrical treatment on potato crops, 1911, MISS E. C. DUDGEON (*Trans. and Jour. Proc. Dumfriesshire and Galloway Nat. Hist. and Antiquarian Soc.*, 24 (1911-12), pp. 143-145).—Previously noted (E. S. R., 26, p. 835) from another source.

Experiments with unsprouted and sprouted potatoes, M. KAREL (*Fühling's Landw. Ztg.*, 61 (1912), No. 22, pp. 777-779).—A report is given of experiments in which unsprouted seed potatoes gave larger yields than tubers that had been allowed to sprout and the sprouts either removed at planting time or allowed to remain. The yield from tubers from which the sprouts were not removed was larger if the tubers were strong and healthy than that from those from which the sprouts had been removed.

In order to get a quantity of plants from a single tuber, the tuber was removed from the sprout after it had been planted and the plant about 8 days above ground, and replanted to grow another set of plants. This method proved successful and is considered useful in the propagation of new varieties.

Rice culture in the Philippines, C. M. CONNER (*Philippine Bur. Agr. Bul.* 12, 1912, pp. 40, pls. 22).—This bulletin describes the methods employed in the cultivation of rice, relates the work that is in progress in testing varieties, and gives a chapter on rice pests.

Rice in Cochin China, A. COQUEREL (*Paddy et Riz de Cochinchine*, Lyon, 1911, pp. VII+225, pls. 17).—The author gives an account of the rice industry of the country under the headings of culture, hand and machine work, milling, improvement, exportation, revenues, and statistics.

Handbook on the sugar industry of the Philippine Islands, G. E. NESOM, H. S. WALKER ET AL. (*Manila: Dept. Pub. Instr.*, 1912, pp. 87+145, pls. 36, figs. 15).—Part 1 of this work on the sugar industry of the Philippine Islands takes up the subject under the following headings: Historic sketch of the sugar industry in the Philippines; sugar production in the Provinces outside of Negros; status of the sugar industry in the Provinces; climate and soil conditions; methods of cultivation, harvesting, transportation, milling, and chemical control; sugar cane pests and diseases; and statistics on sugar in the islands.

Part 2 on the sugar industry in the island of Negros has been previously noted (E. S. R., 26, p. 537).

The storage and marketing of sweet potatoes, W. R. BEATTIE (*U. S. Dept. Agr., Farmers' Bul.* 520, pp. 16, figs. 19).—This bulletin presents plans and directions for the construction of different types of storage houses for sweet potatoes, gives brief notes on the varieties most suitable for marketing, and describes the harvesting, storing, and marketing of the crop.

Effect of fertilizers on the physical and chemical properties of wheat, W. AMES, G. E. BOLTZ, and J. A. STENICS (*Ohio Sta. Bul.* 243, pp. 567-587, fig. 11).—The same varieties of wheat were grown in 1910 on plats of uniform

soil conditions, but under different manurial treatment since 1894. Four- and 5-year rotations were practiced and different amounts and combinations of commercial fertilizers and barnyard manures were applied.

Wheat grown on unfertilized soil, when the smallest yield of grain was obtained, contained 50 per cent of shriveled kernels, and increasing the nitrogen content of the soil accentuated this condition. Potassium increased the proportion of plump kernels, although the yield was the same as when nitrogen was applied to the soil and the composition was practically the same as that found in the wheat from unfertilized soil. Phosphorus improved the physical appearance of the grain to the greatest extent. The protein, carbohydrate, and phosphorus content of the wheat grain bore a complementary relation to each other, while an inverse ratio existed between the percentages of protein and carbohydrates. The phosphorus and carbohydrates stood in a direct ratio to each other. The largest percentages of phosphorus and carbohydrates were found in the best developed grain, which was in turn associated with the highest yields.

The percentage of protein was highest in wheat grown on soil deficient in phosphorus and well-supplied with available nitrogen. The relation between the carbohydrates and phosphorus on the one hand and protein on the other was influenced by the form in which the nitrogen was supplied, whether from organic or inorganic sources and by the ratio of phosphorus to nitrogen. The ratio of phosphorus to nitrogen in the wheat grain generally stood in the same order as the ratio of phosphorus to nitrogen supplied to the soil, and the percentages of gluten and gliadin stood in a direct relation to the total protein content of the wheat.

Preparing grains for seeding, E. SCHAEFFER (*Fühling's Landw. Zig.*, 61 (1912), No. 29, pp. 655-682, figs. 2).—Methods of cleaning the seeds and treating with fungicides that may be practiced on the farm are described.

An experiment to determine the retarding effect of orwood on the germination of seeds, W. H. LAWRENCE (*Washington Sta. Bul.*, 7, spec. ser., pp. 113-115, figs. 2).—An experiment was conducted to determine the strength of a solution of this substance which may be used without injury to the grain. Solutions of different strength were used on 3 varieties each of oats and wheat. A solution of "orwood" 1:4 in all 6 experiments retarded germination for several days. Oats were found less subject to injury than wheat.

The seed importation act of August 24, 1912 (*U. S. Dept. Agr., Office Secretary Circ.*, 42, pp. 6).—This circular includes the text of the act (E. S. R. 27, p. 494), the rules and regulations for its enforcement, definitions of various terms and the names of the plants considered weeds.

References on plant breeding, C. FRUWIRTH (*Jour. Landw.*, 60 (1912), No. 2, pp. 151-181).—Abstracts of 56 recent publications are given.

References to recent work in agriculture, C. FRUWIRTH (*Jour. Landw.*, 60 (1912), No. 3, pp. 375-406).—Abstracts of 63 publications are presented.

Proceedings of the American Society of Agronomy, [1910] (*Proc. Amer. Soc. Agron.*, 2 (1910), pp. 154, pls. 6, figs. 22).—This volume contains the complete minutes of the Washington meeting, November 14 and 15, 1910 (E. S. R. 24, p. 195), a list of members, and 15 of the 20 papers presented, as follows:

A Test of Planting Plots with the Same Ears of Corn to Secure Greater Uniformity in Yield, by T. L. Lyon; A Comparison of the Error in Yields of Wheat from Plots and from Single Rows in Multiple Series, by T. L. Lyon; Analysis of Yield in Cereals, by L. R. Waldron; Method of Keeping Crop Records at Michigan Station, by F. A. Spragg; The Work of the Committee on Seed Improvement of the Council of North American Grain Exchanges, by B. Ball; Methods for Testing the Seed Value of Light and Heavy Kernels in Cereals

by E. G. Montgomery; Standardization of Field Experimental Methods in Agronomy, by C. V. Piper and W. H. Stevenson; Methods in Breeding Cereals for Rust Resistance, by E. C. Johnson; Interpretations of Results Noted in Experiments upon Cereal Cropping Methods after Soil Sterilization, by H. L. Bailey; Technical Terms in Agronomy, by C. R. Ball; Long Versus Short periods of Transpiration in Plants Used as Indicators of Soil Fertility, by F. S. Harris; The Theory of Soil Management, by F. K. Cameron; Some Causes of Soil Granulation, by E. O. Fippin; Moisture and Nitrate Relations in Dry-Land Agriculture, by H. O. Buckman; and "Moisture Equivalent" Determinations and their Application, by L. J. Briggs and J. W. McLane.

Proceedings of the American Society of Agronomy, [1911] (*Proc. Amer. Soc. Agron.*, 3 (1911), pp. 286, pls. 4, figs. 51).—Aside from the complete minutes of the meeting at Columbus, Ohio, November 13 and 14, 1911 (*E. S. R.*, 26, p. 196), this report includes the following named articles:

Instruction in Farm Crops, by M. L. Fisher; The Relation of Protein Content of Wheat to Rainfall, by R. W. Thatcher; The Pure-Line Method of Breeding Drought-Resistant Wheats and Similar Cereals, by C. Salmon; The Inheritance and Effect of Sucker Production in Corn, by A. T. Wiancko; The Influence of the Soil Type on the Plant Variety, by J. L. Burgess; A Preliminary Report on a Field Study of Soil Moisture, by A. G. McCall and H. J. Bower; The Practical Classification of Soils, by E. O. Fippin; Some Experiments to Estimate Errors in Field Plot Tests, by T. L. Lyon; The Development of Soil Survey Work in the United States, with a Brief Reference to Foreign Countries, by G. N. Coffey; Transpiration of Wheat Seedlings as Affected by Soils, by Solutions of Different Ions, and by Various Chemical Compounds, by G. J. Bouyoucos; The Effect of Soil Moisture and Temperature on the Availability of Plant Nutrients in the Soil, by J. O. Morgan; Application of Wilting Coefficient Determinations in Agronomic Investigations, by L. J. Briggs and H. L. Shantz; and Methods of Determining the Water Requirements of Crops, by E. G. Montgomery.

HORTICULTURE.

Some factors influencing the efficiency of Bordeaux mixture, L. A. HAWKINS (*U. S. Dept. Agr., Bur. Plant Indus. Bul.* 265, pp. 29, figs. 4).—The first part of this paper describes comparative tests conducted to determine the effect on the rate of subsidence of the suspension of various methods advocated for preparing Bordeaux mixture. The second part of the paper describes experiments with different compounds added to Bordeaux mixture to increase its adhesiveness, and conducted in connection with spraying experiments for the control of the black rot of the grape in New Jersey and in Michigan. A bibliography of related studies is included.

The tests of various methods of preparing Bordeaux mixture have shown that a mixture in which the suspension of the copper compound settles out slowly may be prepared by adding the concentrated calcium hydroxid to the diluted copper sulphate solution or vice versa, provided the mixture is sufficiently agitated. Practically as good results were obtained with these methods of preparation as by diluting the 2 components in separate vessels and pouring them simultaneously into a third as recommended by Galloway (*E. S. R.*, 8, p. 240). This method of mixing a concentrate and a dilute solution is not designed to replace the old gravity method with its elevated platform but offers a convenient substitute where for any reason the gravity method is impracticable. The author is of the opinion, however, that the agitation necessary for preparing Bordeaux mixture with a low rate of subsidence by this method can hardly be obtained in practice except by means of a power outfit provided with a good agitator.

In the experiments on the adhesiveness of certain Bordeaux mixtures and the relative value of certain adhesive compounds, it was shown by determining the quantity of copper retained on the leaves sprayed with the different mixtures that the addition of resin-fish oil soap slightly increases the adhesiveness of the mixture. Two lbs. of resin-fish oil soap to 50 gal. of mixture gave the best results and is recommended as the most economical and efficient adhesive for use on grape berries. From the results obtained it seems probable that with the addition of soap a 3:2:50 Bordeaux mixture would be effective in spraying grapes. A laboratory method of approximating the relative adhesiveness of these fungicides to grapes is here described.

Partial sterilization of soil for glasshouse work, E. J. RUSSELL and F. R. PETERMANN (*Jour. Bd. Agr. [London], 19 (1913), No. 10, pp. 809-827, pls. 5, fig. 1*).—Various appliances for partial sterilization by means of heat and the relative efficiency of different antiseptic treatments are discussed in this article.

Although none of the antiseptics used were as effective as heat, several were found to be superior to iodol, which has heretofore been used by the authors. The most effective group of substances used in the experiments included formaldehyde, pyridene, collidene, liddene, etc. The search for still more effective antiseptics is to be continued.

Cheap antiseptics for use in horticulture and agriculture, E. J. RUSSELL (*Chem. World, 2 (1913), No. 2, pp. 41-43, figs. 2*).—This is a brief discussion of the subject more fully treated in the article noted above.

Manures for garden and farm crops, W. DYKE, edited by T. W. SANDERS (*London [1911], pp. 116, pl. 1, figs. 8*).—This is a popular handbook "dealing with manures and fertilizers, their nature and composition; adaptability to various soils; and their application to fruit, flower, vegetable, market garden, and farm crops; outdoor and indoor flowering plants, lawns, etc.; with special formulas for each."

The market garden: How to start and run it profitably (London, 1912, pp. 188, figs. 15).—A popular treatise on intensive gardening written by the gardening experts of The Smallholders' Union, London.

History of vegetables, G. GIBAUD (*Histoire des Légumes. Paris, 1912, pp. VIII+404, figs. 10*).—This work comprises historical accounts of vegetables cultivated in the temperate climate of Europe. The vegetables are grouped with special reference to the edible parts of the plants and discussed in alphabetical order.

[Variety tests of vegetables], W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser., pp. 73-90, figs. 2*).—Notes and yield data are given of variety tests of different kinds of vegetables conducted at the Western Washington Substation in 1909 and 1910. Some data are also given showing the internal characteristics and variations in garden beets.

Methods used in breeding asparagus for rust resistance, J. B. NORRIS (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 263, pp. 60, pls. 18, figs. 4*).—This paper discusses the methods developed in the selection, pollination, and breeding of asparagus at Concord, Mass., in cooperation with the Massachusetts Station (E. S. R., 28, p. 330). The subject matter is discussed under the following general headings: Preliminary work, selection, breeding, bud propagation, pedigree, plans for distribution, and suggestions to breeders and growers. Introductory considerations deal with the history of asparagus rust and previous attempts to control it by spraying and breeding.

In making selections for rust resistance several acres of the best stock obtainable were used. From the different strains several hundred plants have been selected for pedigree testing after being subjected to attacks of rust.

Progeny tests of select plants have been made each season since 1909. The rust resistance and vigor of these seedlings have determined the value of the breeding parents, although the author finds that structural difference appears to bear a closer relation to rust resistance than vigor. The test male A7-33 and the test female B32-39 have given a very superior progeny which has proved satisfactory as a "commercially immune" type. This progeny has been named and plans are under way for its production in quantity. Breeders and growers are advised to take up pedigree breeding to produce good strains and to use careful methods in keeping rust out of producing fields.

Asparagus breeding. J. B. NORTON (*Ann. Rpt. Amer. Breeders' Assoc.*, 8 (1912), pp. 440-444).—This comprises a review of the author's breeding investigations through the season of 1911 (E. S. R., 28, p. 339), together with a discussion of methods employed in carrying out the work.

Strain tests of cabbage. C. E. MYERS (*Pennsylvania Sta. Bul.* 119, pp. 15, pp. 3).—In continuation of a previous test of Jersey Wakefield strains (E. S. R., 22, p. 640), the cabbage tests were extended in 1909 to include numerous strains of Jersey Wakefield, Charleston Wakefield, Early Spring, Early Summer, Danish Ballhead, Succession, Flat Dutch, Sureheid, and Volga. The tests were conducted through the 3 seasons 1909 to 1911 and the data for each year are tabulated and discussed.

Although the attempt was made to test all strains under the same conditions, including a correction of differences in soil fertility, the data secured in these tests show important variations within varieties of cabbage. The average variation in yield for the tests as a whole was somewhat more than 7 tons per acre. The author attributes these differences to differences of inherent properties of the seed and emphasizes the importance of giving greater attention to heredity in the production of our economic plants.

Preliminary notes on pepper hybrids. H. J. WEBBER (*Ann. Rpt. Amer. Breeders' Assoc.*, 7 (1911), pp. 188-199, figs. 8).—This comprises a preliminary note on inheritance studies with peppers started in the summer of 1908. Consideration is here given to the first and second generation hybrids secured from 2 crosses with reference to size of leaf and fruit, color and position of oil, flavor, color of young fruit, apex of fruit, and form of branching.

No definite conclusions or deductions have been made from the data thus far secured. In the series of hybrids secured from Red Chili x Golden Dawn there appears a striking instance of the apparent origination of a new character by hybridization. Both parents are medium-sized types in the pepper group. Then the coarse branches of the male parent, Golden Dawn, are combined in the hybrid with the erect and many branches of the female parent, Red Chili, the result is a giant plant as compared with either parent. On the other hand, when the fine branches of the female parent are combined in the hybrid with the horizontal and few branches of the male parent, the result is a dwarf plant as compared with either of the parent forms. The author suggests that the appearance of these new characters is due to the recombination of the heredity units or genes of the parental types.

A Mendelian study of tomatoes. A. W. GILBERT (*Ann. Rpt. Amer. Breeders' Assoc.*, 7 (1911), pp. 169-188, fig. 1).—The author made a number of crosses in 1907 and 1908 to test the behavior of unit characters in tomato hybrids. A table of the crosses and their allelomorphous pairs together with brief data on the first and second generation hybrids are given, after which the crosses and their offspring are grouped and discussed with respect to similar allelomorphous characters of variety.

The results of this investigation are summarized as follows:

"Tomatoes contain numerous separately heritable units which are inherited in alternative fashion without blending. Some characters, such as red and scarlet colors of fruit and tall vines, are completely dominant over their allelomorphs. Such characters as the size and shape of fruit are evidently made up of numerous unit characters. The gross appearance of the F_1 generation is a blend between the parents, but in the second generation types appear forming an almost complete series ranging from the large round parent to the small pear or plum-shaped one. Dominance and recessiveness depend upon the characters themselves and are independent of the races crossed. Complete segregation takes place, except possibly where size and shape are concerned, and the actual ratios of types produced are very close to the theoretical Mendelian ratios.

"A demonstration is afforded of the economic and commercial use of Mendelism. Desirable unit characters may be transferred from one plant to another almost at will. Mendelism has an unlimited commercial application. If a sufficient number of second-generation hybrids are used all possible combinations are produced and no new kinds are found in the third generation. The third-generation hybrids of these tomatoes, the data of which are not presented in this article, prove this."

Polymorphism in the stamens of the flowers of fruit trees, M. NOVIKOV (*Selsk. Khoz. i Lesov.*, 239 (1912), Nos. 7, pp. 331-343; 8, pp. 470-481; abs. in *Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intcl. and Plant Diseases*, 3 (1912), No. 12, pp. 2659, 2661).—The numerous researches of the author have demonstrated the fact that polymorphism in flowers constitutes a general rule for almond, apricot, peach, pear, plum, apple, and cherry trees. This is evidenced by the different lengths of the stamens and pistils and by the resulting relative positions of stigmas and anthers. In the rosaceous stone fruits the inner stamens, which are also the shortest, mature before the outer and longer ones, whereas in rosaceous plants with soft pericarp and free seeds the contrary is the rule. The author suggests the value of polymorphism in peach blooms as an aid in distinguishing and classifying the very numerous subvarieties.

Attention is called to the common phenomenon of flower doubling and the presence of forms which mark a gradual passage from stamens to petals. Although this tendency may lead to sterility in a great many cases, it is pointed out that in other cases the exuberant formation of petals diminishes but slightly the fruitfulness of the plant, as for instance in the Reine-Claude de Meroldt plum.

Apple breeding in Canada, W. T. MACOUN (*Ann. Rpt. Amer. Breeders' Assoc.*, 8 (1912), pp. 479-487).—A review of apple breeding investigations in Canada dealing especially with investigations conducted by Saunders (E. S. R., 25, p. 643), and the author and others at the Central Experimental Farm, Ottawa (E. S. R., 27, p. 343).

Systematic botany of the plum as related to the breeding of new varieties, W. F. WRIGHT (*Ann. Rpt. Amer. Breeders' Assoc.*, 8 (1912), pp. 488-497).—The author indicates the species of plums which have been utilized in horticulture and calls attention to many other native and Old World species which might be used to advantage in developing varieties of plums better suited to American conditions. The importance of a thorough knowledge of the relationships between species in order to secure successful hybrids is pointed out.

Mendelian inheritance in Prunus hybrids, S. A. BEACH and T. J. MAST (*Ann. Rpt. Amer. Breeders' Assoc.*, 7 (1911), pp. 214-226, figs. 12).—This comprises a contribution to the knowledge of Mendelian inheritance in Prunus hybrids. Two general classes of F_1 Prunus hybrids produced by unguarded F.

parents were under observation. One class is composed of sand cherry-cherry hybrids and the other of sand cherry-plum hybrids.

The inheritance of the characters of color of foliage, form of leaf, persistence of stipules, habit of tree growth, and immunity from plant lice are discussed and the correlation of certain characters is also noted. The sand cherry-cherry hybrids were originally secured by cross-pollinating the western sand cherry with pollen of the Montmorency cherry. The sand cherry-plum hybrids were secured by pollinating the Dwarf Rocky Mountain cherry with pollen of the Wyant plum.

The authors find that in both sets of hybrid plants the character of immunity from aphid is Mendelian. Susceptibility to aphid attacks is transmitted by both the Montmorency cherry and by the Wyant plum as a recessive character. It was observed that all of the F_2 hybrids of sand cherry x Montmorency which were infested with aphid and had leaves of the Montmorency type of base also had the Montmorency type of color of foliage. The converse, however, did not hold true. With a single exception all of the aphid-infested F_2 hybrids of sand cherry x Wyant which had foliage with the Wyant type of color also had leaves with the Wyant type of base, but the converse in this case did not hold true. The leaf of the exceptional plant referred to had an intermediate form of base favoring the sand cherry. Hybrid plants attacked by the aphid resembled in texture the Montmorency or Wyant, respectively, according to their percentage, while those which were immune from the aphid resembled the sand cherry most closely in form, color, and texture.

The influence of stock on scion and a case of dimorphism. J. PAELINCK (*Gibb's Hort. (Brussels)*, 7 (1912), No. 337, pp. 774, 775).—The author describes a case in which the black heart cherry, Early Rivers variety, having dark red fruit, was grafted on mahaleb stock. As compared with the fruit of the parent, Early Rivers, the fruit from the resulting tree was changed in color to a yellowish white, matured some 8 days later, and was smaller. Scions from this white-fruited tree were then grafted on *Prunus avium*, mazzard stock having small black fruit, to see if the white fruits would revert to the dark color. The result was negative. As far as this one variety of black heart cherry is concerned, the use of mahaleb stock appears to have been detrimental to the fruit.

A case of dimorphism is also described in which a mauve colored autumn chrysanthemum gave a sport some 6 years ago which bore yellowish white flowers with greenish reflex toward the center. The new variety has thus far preserved the qualities of the parent plant.

In a third case observed by the author a white-flowered zonal geranium gave plants which bore clusters of white flowers and of brick-red flowers on the same plant. This variation is still maintained by asexual propagation.

Bud selections as a means of improving citrus and other fruits. A. D. SHAMEL (*Ann. Rpt. Amer. Breeders' Assoc.*, 8 (1912), pp. 497-503).—A paper on this subject based on the author's studies in the citrus groves of southern California (E. S. R., 25, p. 329; 27, p. 441), together with some observations on peach varieties in Connecticut.

Variation studies of the venation angles and leaf dimensions in *Vitis*, M. J. DOSSY (*Ann. Rpt. Amer. Breeders' Assoc.*, 7 (1911), pp. 227-259, figs. 2).—This comprises a statistical study of the variability and relationship of the leaf dimensions and of the angles of venation and their range of variability.

The author reviews the work of Ravaz, who made extensive use of the venation angles and the ratio of vein lengths in variety descriptions in his American Vines (E. S. R., 15, p. 585), as well as the investigations of Sacca, who found

(E. S. R., 22, p. 141), a correlation between the size of the angle formed by the midrib and the outer large vein at the base of the leaf and productivity.

Various measurements were made of leaves of different species to check up the results of the above investigators and a special study was made of the 2 species, *Vitis vulpina* and *V. bicolor*, to determine how constant the leaf dimensions and their relations were in individual vines within the species. A review of the work as a whole leads the author to conclude in substance that the leaf of vitifolys is quite variable in the different species and has in some species taxonomic characters which alone are sufficient for identification. The variation occurring in the angle of venation renders this character less valuable for taxonomic purposes where only slight differences occur between species or varieties. The limited data available indicate that the larger angle is dominant in crosses between 2 species. Owing to this influence, it is concluded that further study is needed to establish fully the correlation which Sacca believes to exist between the angle formed by the midrib and the second large lateral vein and productivity.

Within the species and the variety different individuals have distinct frequency distributions for the venation angles. Studies of the leaf dimensions of *V. bicolor* and *V. vulpina* show that the leaf of *V. bicolor* is larger, has a longer petiole in proportion to length of leaf, and a shorter leaf in proportion to its width.

Longavino and the mutation theory, T. V. MUXSON (*Ann. Rpt. Amer. Breeders' Assoc.*, 8 (1912), pp. 444-448).—An account of a composite hybrid of 6 species of grape, with the steps in its production and the results in each successive combination.

[Variety tests of fruits], W. H. LAWRENCE (*Washington Sta. Bul.* 7, spec. ser., pp. 91-95). Notes are given on the growth, character, and behavior of different varieties of gooseberries, currants, blackberries, dewberries, raspberries, and strawberries being tested at the Western Washington Substation.

Plant breeding, W. H. LAWRENCE (*Washington Sta. Bul.* 7, spec. ser., pp. 115-118, fig. 1). A summarized account is given of hybridization work with blackberries, dewberries, raspberries, and the salmonberry conducted during 1909 and 1910, together with some data on color and seed characteristics of hybrid fruits secured in 1910.

Cacao culture, L. MARTINEZ (*Cultura y Beneficio del Cacahutero. Mexico. Goetz.*, 1912, 2. ed., pp. 72, pls. 16).—This comprises a popular treatise on the history, botany, culture, preparation for market, and uses of cacao.

The palms, C. L. GATIN (*Les Palmiers. Paris*, 1912, pp. 111+338, figs. 36).—This work treats of the natural and horticultural history of the different genera of palms. In part 1 consideration is given to the morphology, anatomy, reproduction, chemistry, classification, and distribution of palms. Part 2 discusses the propagation and culture of ornamental palms, both outdoors and under glass. The principal genera are also described. A list of palms growing in the French colonies and a bibliography are appended.

Report on a study of tea culture in Ceylon and British India, C. BERNARD (*Verslag over een Reis naar Ceylon en Britsch-Indië ter Bestudeering van de Theecultuur. [Buitenzorg]: Dept. Landb., Nijf. en Handel.*, [1912], pp. 112, pls. 16).—This comprises the results of a survey on tea culture in Ceylon and British India, conducted under the direction of the Javanese government, with the view of familiarizing planters in the last-named country with culture practices in the English colonies. The methods of culture, management, and preparation of tea for market are discussed in detail.

The Persian walnut industry of the United States. I. R. LAKE (*U. S. Dept. Agr., Bur. Plant Indus., Bul. 254, pp. 112, pls. 11, figs. 24*).—This comprises a practical treatise on Persian walnut culture, including also varietal descriptions and information in regard to various phases of the industry in the United States. The subject matter is discussed under the general headings of a description of the Persian walnut tree; the crop and its uses; distribution and areas of culture; climatic conditions required; soil requirements; factors in locating a walnut orchard; varieties and types of walnuts; propagation; planting, training, and pruning; cultivation of the orchard; pests and diseases; harvesting the crop and preparing it for market; and walnut growing as a business. A bibliography is appended.

Carnation breeding. L. D. BATCHELOR (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 199-205*).—Carnation hybridization studies started by the author in 1905 and here reported appear to confirm the theory advanced by Norton and also confirmed by Stuart (*E. S. R., 28, p. 438*) that the commercial carnation is a heterozygous or unfixed hybrid of the single \times double carnation in which the single is recessive to the double. Reference is made to similar results secured by H. J. Webber with a lot of seedling carnations started by Norton. These results indicate from a practical standpoint that if the desired color and plant characters are obtained in individuals with either single or double flowers, they can be easily recombined in a hybrid of normal standard or commercial form and may be perpetuated by propagating from cuttings henceforth.

Smith's chrysanthemum manual. E. D. SMITH (*[Adrian, Mich.], 1913, 3. d., pp. 106, figs. 39*).—A practical treatise on chrysanthemum culture intended for both florists and amateurs. The present edition has been revised and enlarged.

FORESTRY.

Report of the director of forestry for the year 1912, R. H. CAMPBELL ET AL. (*Dept. Int. Canada Ann. Rpt., 1912, pt. C, pp. 171-1-176, pt. 1, figs. 29*).—In addition to a general report on the work of the forestry branch for the year 1911-12, reports of officials in charge of forest reserves, tree plantations, grazing, fire protection, forest surveys, etc., are also given.

Annual report of committee on breeding nut and forest trees, G. B. STUWORTH (*Ann. Rpt. Amer. Breeders' Assoc., 7 (1911), pp. 250-255*).—This report comprises essentially an account of the general progress made by the Forest Service of this Department in tree breeding and in the introduction of exotics during the year 1910. The principal experiments noted include a test of western yellow pine and Douglas fir seed from different sources, experiments to extend the immediate natural range of forest trees, cultural tests of exotics at the Fremont Station, Colorado, and the introduction of cork oak seedlings into southern California and of maritime pine into Florida.

Report of committee on breeding nut and forest trees, G. B. STUWORTH (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 515-522*).—This report surveys the main achievements in tree breeding accomplished at home and abroad during 1911. The subject matter is discussed under the general headings of sources of seed, studies of range extension, breeding new strains of basket willows, and theory of acclimatizing trees.

Forest seed collection to gain the benefits of environment, G. L. CLOTHIER (*Ann. Rpt. Amer. Breeders' Assoc., 8 (1912), pp. 522-525*).—In this paper the author points out some of the desirable effects of environment, the benefits of which may be gained by a proper regulation of forest seed collection.

Mechanical properties of western hemlock, O. P. M. GOSS (*U. S. Dept. Agr., Forest Serv. Bul. 115, pp. 45, pls. 7, figs. 12*).—This bulletin presents the results of one of a series of mechanical tests of structural timbers which have been conducted by the Forest Service (*E. S. R., 28, p. 50*).

Various tests were made of hemlock bridge stringers and of small, clear pieces cut from the uninjured portions of tested stringers to show strength in bending, the compression parallel and perpendicular to the grain, shearing, shrinkage, and moisture content. A study was also made of the relation of defects, rate of growth, weight, and proportion of summerwood to the mechanical properties, and of strength as affected by seasoning. The results of the various tests are tabulated and discussed.

They show in general that western hemlock is well-suited for use in all but the heaviest construction work. Notes are given on its various uses at the present time, together with specifications and grading rules. Some data on bending and compression tests of small, clear sticks are appended.

Greenheart, C. D. MELL and W. D. BAUSH (*U. S. Dept. Agr., Forest Serv. Circ. 211, pp. 12, pls. 4*).—This circular comprises an account of greenheart (*Nectandra rodieri*), a South American and West Indian tree noted for the lasting qualities of the mature wood. The subject matter is discussed under the following general headings: Importance of the wood, uses and durability, distribution, logging and transportation, market, the tree, gross and anatomical characters of the wood, and substitutes for greenheart.

Circassian walnut, G. B. STEWORTH and C. D. MELL (*U. S. Dept. Agr., Forest Serv. Circ. 212, pp. 12, pls. 5*).—A discussion of the Circassian or English walnut (*Juglans regia*) with special reference to utilization of the wood. The following phases are discussed: Common names, uses, native and cultivated range, sources of supply, logging and transportation to market, waste in preparing logs for shipment, consumption of Circassian walnut in the United States, gross and minute characters of the wood, and substitutes.

The treatment of woods in France, C. BROILLIARD (*Le Traitement des Bois en France, Paris and Nancy, 1911, 3. ed., pp. XXI+685, pl. 1*).—A treatise on the valuation, division, and usufruct of forests.

Part I discusses the general administration of forests. The succeeding parts deal with the management of coppice, coppice with standards, even-aged high forests, and reforested areas. Consideration is also given to the structure and utilization of various species of timber and to the valuation of forests.

DISEASES OF PLANTS.

Diseases of plants, W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser. no. 95-102*).—Notes are given on observations made on various diseases of plants during the period from November, 1907, to April, 1911, when the author was connected with the Western Washington Substation. The notes include a report on the comparative value of some fungicides for controlling oat smut; smuts of oats, wheat, and barley; observations on apple scab, black-spot apple rot, crown rot of alfalfa, brown rot of prunes and cherries, and fruit rot of raspberries.

In a comparative test of the value of Orwood, a fungicide recommended for controlling oat smut, it was found that while it gave fairly good results, it was not as efficient as formalin for this purpose.

The author reports on the use of lime-sulphur mixture for the control of apple scab, and describes a rot of stored apples which proved quite destructive during the winter of 1911. The cause of the rot was not determined.

The crown rot of alfalfa and clover, due to *Sclerotinia trifoliorum*, is described at some length, observations having been made on the fungus at different times throughout the season.

The author records having observed in April, 1910, the apothecia of the brown rot of prunes and cherries developed from cherries lying on the surface of the ground or partially buried.

The fruit rot of raspberries, which was first noticed in 1902, became very troublesome in 1910, and from reports received it appeared that from 25 to 30 per cent of the fruit in some fields was destroyed. A study was made of the disease, which is apparently due to some fungus, and it was found that not only the fruit but also the buds and fruiting branches were attacked. Different varieties of raspberries and loganberries varied in susceptibility to the disease.

Work connected with insect and fungus pests and their control, J. C. MOORE (*Rpt. Agr. Dept. St. Lucia, 1911-12, pp. 9-11*).—The author briefly reports upon the occurrence of a number of diseases of economic plants, among them the root disease and red rot fungus of sugar cane, diseases of cacao, bananas, limes, coconuts, etc.

The root disease of cacao is said to be causing some anxiety on account of its spread, and a list is given of host plants known to be attacked by the same fungus. The roots of many of the plants, however, were found to be in contact with diseased roots of cacao, and it is possible that they may not regularly be hosts of the fungus.

In connection with the banana disease, which is not definitely determined but which is reported as that particularly attacking the Gros Michel variety, the author notes several varieties as only moderately susceptible or comparatively resistant, and experiments are in progress to determine the degree of resistance.

The gray fungus (*Thelophora pedicellata*), noted previously (E. S. R., 27, p. 445) as occurring on limes, has not proved to be a cause of serious damage.

An unidentified fungus is reported on the pod of the Lyon bean (*Stizolobium virgatum*) grown at the experiment station, and the presence of *Hypochyrella corymbosa* on the Java plum (*Eugenia jambolana*) is reported, where the fungus is causing some injury to the leaves.

[Plant diseases, 1911], R. SCHANDER (*Mitt. Kaiser Wilhelms Inst. Landw. Bromberg, 5 (1912), No. 1, pp. 53-72*).—Besides reporting on several related studies, the author gives a brief account of some investigations carried out in 1911 on leaf spot of cereals, the physiology of *Phoma betae*, the loose smut of barley and wheat, various potato diseases, leaf roll of tomatoes, Cuscuta, and *Heterodera schachtii* affecting beets and grains.

[Diseases and vegetable parasites, 1911], G. BAIOSI (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 11 (1912), No. 4-6, pp. 30-49*).—This is a condensed report from the Pavia station of cryptogamic botany on diseases and plant parasites observed during 1911.

Culturing of parasitic fungi on the living host, J. E. MELHUS (*Phytopathology, 2 (1912), No. 5, pp. 197-203, pl. 1, figs. 2*).—The author describes a method of infecting plants with parasitic fungi, and gives briefly an account of cultural studies with a number of species that he has successfully grown upon living plants.

Studies of fungus parasites belonging to the genus *Glomerella*, C. L. SHERB and ANNA K. WOOD (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 252, pp. 110, pls. 18, figs. 4*).—This bulletin gives a detailed account of investigations previously reported (E. S. R., 26, p. 645). The life histories and relationships as well as the physiological and pathological characteristics of the organisms from 35 different host plants are described.

Summarizing their investigations, the authors claim that most cultivated fruits, as well as many other economic plants are attacked by fungus parasites of the genus *Glomerella*. These fungi pass through three stages in the course of their complete development and produce three kinds of spores, conidia, ascospores, and chlamydospores. The conidial stage is most frequently observed, and it is estimated that about 500 species of *Glaosporium* and *Colletotrichum* probably belong to the genus *Glomerella*. Most of the forms studied indicate that there are neither morphological nor physiological differences sufficient for their segregation, all of the material from the 36 hosts belonging to the three species, *Glomerella cingulata*, *G. gossypii*, and *G. lindemuthianum*. Detailed accounts are given of the results of inoculation experiments, upon which are based the conclusions drawn by the authors.

A bibliography is appended.

Infection experiments with conidia of *Claviceps*, R. STÄGER (*Mycol. Centbl.*, 1 (1912), No. 7-8, pp. 198-201).—The author claims to have demonstrated by experiments that summer spores of *C. purpurea*, which have lived over winter, still possess when 10 months old their full power of germination and infection.

A new Urocystis, P. MAGNUS (*Ber. Duit. Bot. Gesell.*, 39 (1912), No. 6, pp. 290-293, fig. 1; abs. in *Internat. Inst. Agr.* [Rome], *Rul. Bur. Agr. Intel. and Plant Disease*, 3 (1912), No. 9, p. 2099).—The author figures and describes a fungus said to be new and to cause a smut of *Melica eupani*. The parasite attacks the leaves and flowers, and the name *U. bornmülleri* has been given it.

Mechanical estimation of resistance of grains to disease and injuries, F. STRANAK (*Ztschr. Gesam. Getreidek.*, 4 (1912), No. 2, pp. 37-41, fig. 1; abs. in *Cerebl. Bakl. [etc.]*, 2, Abt., 45 (1912), No. 29-34, pp. 497, 498).—The substance of this has already been noted (E. S. R., 25, p. 244).

Degree of infection by *Fusarium* in recent years, L. HILTNER and GENTIN (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, 10 (1912), No. 9, pp. 99-101).—The authors, in pursuance of previous reports (E. S. R., 27, p. 351), give tabulated figures obtained from examinations made on infection of both winter and summer grains for 1909-10, 1910-11, and 1911-12, and recommend a more general use of corrosive sublimate in treatment of seed.

Dipping seed for winter grains, L. HILTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser.*, 10 (1912), No. 9, pp. 97, 98).—The author reports some good results from the treatment of rye seed with corrosive sublimate solution as protection against *Fusarium*. A like treatment after the plan indicated is also recommended to prevent stinking smut in winter wheat. Sublimoform, containing both corrosive sublimate and formaldehyde, is favored. In case of very sensitive varieties, as Squarehead, a mixture called blue sublimoform, consisting of the sublimate, copper sulphate, and formalin, is recommended. Estimates of comparative cost are given. See also a previous note (E. S. R., 27, p. 351).

Experiments for the prevention of stem smut of rye, F. K. RAVN (*Tidskr. Landbr. Plantavl.*, 19 (1912), No. 2, pp. 214-228).—By the hot-water method (immersion in water of about 54° C. for 5 minutes, with 20 dippings, without previous treatment, and with immediate cooling) the percentage of smut was reduced from 16 to 2, and the yields were increased by 250 kg. of grain and 300 kg. straw per hectare (about 222.5 and 320.4 lbs. per acre). By the formaldehyde treatment (sprinkling with from 0.1 to 0.13 per cent solution and leaving the pile for from 10 to 12 hours) a reduction to 1 per cent was secured and an increase in yield of 310 kg. grain and 430 kg. straw per hectare.

The severity of the attack of the stem smut depends on the time of sowing, being greatest with early sowing. Treatment for smut is therefore most important in the case of early sowing, but as it will also prevent other diseases

that appear especially with late sowing there is every reason always to recommend it for rye, whether this is sown early or late.

Some observations on stinking smut in wheat, W. OETKEN (*Deut. Landw. press.*, 39 (1912), No. 70, pp. 893, 894).—The author reports that throughout large districts of Saxony both winter and summer wheat were attacked by stinking smut, the degree of severity varying with the seed, kind of soil, and time of planting. All varieties sown on March 27 showed a much higher degree of infection than did the same sorts sown 22 days later. The high percentages shown in the spring sowings are ascribed to a concurrence of conditions particularly favorable to smut infection in 1912.

Clover canker, E. HASELHOFF (*Illus. Landw. Ztg.*, 32 (1912), No. 45, p. 416; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 35 (1912), No. 20-24, p. 535).—The author describes a canker affecting several varieties of clover due to a fungus not named. No specific remedy is given, but plowing under and rotation with non-susceptible crops are recommended.

The comparative susceptibility of cruciferous plants to *Plasmodiophora brassicae*, G. C. CUNNINGHAM (*Phytopathology*, 2 (1912), No. 4, pp. 138-142; *abs. in Jour. Bd. Agr. [London]*, 19 (1912), No. 8, pp. 668, 669).—In the spring and summer of 1911 the author carried on experiments near the Vermont Experiment Station on a tract of land which had become badly infected with club root from the continued cultivation of varieties of *Brassica oleracea* to determine the relative susceptibility of other cruciferous plants. Seeds of as many varieties of crucifers as possible were obtained and sown upon the infected soil, and at intervals they were examined for the appearance, nature, and extent of the disease.

The results of the examination are given in tabular form, from which it appears that there is a wide range of susceptibility among the Cruciferae, not only among the different genera but also among the species within the genera and to an equal extent the varieties of the same species. One variety of *B. oleracea* showed 100 per cent of plants badly infected, while *B. rapa* showed only 1.1 per cent diseased. A similar condition was found to obtain with other species. In the case of cabbages one variety showed a susceptibility of 100 per cent as compared with 73.5 with another. The same was true among varieties of radishes, indicating, from the wide range of susceptibility, that there may be some varieties more resistant to this parasite than the ones commonly cultivated.

On the present status of the beet nematode question, R. SCHANDER and M. WOLFF (*Deut. Zuckerindus.*, 37 (1912), No. 7, pp. 157, 158; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 35 (1912), No. 20-24, pp. 537, 538).—Discussions are given which cover briefly the history of investigations on beet nematode injury, the biology of *Heterodera schachtii*, the nature and tendency of injury exhibited, and modes of combating the ravages inflicted so far as yet worked out.

Infection experiments with *Thielavia basicola* on ginseng, J. ROSENBAUM (*Phytopathology*, 2 (1912), No. 5, pp. 191-196, pls. 2).—In this paper the author reports inoculation experiments with *T. basicola* obtained from different host plants to determine its relations with one of the most common and serious diseases affecting ginseng.

From a comparison of the cultures from different hosts and from infection experiments it appears that the forms of *T. basicola* found on cotton, tobacco, and ginseng are identical. It was found possible to infect ginseng and tobacco without previous injury to the young plants, but when older plants were used infection did not always follow. In experiments with ginseng the fungus was found able to attack the aerial as well as the underground parts of the plant.

A disease of potatoes new in Italy (*Cercospora concors*), A. TONELLI (*Riv. Agr. [Parma]*, 18 (1912), No. 46, pp. 724, 725).—The author briefly describes a disease of potatoes, ascribed to *C. concors*, only recently noted in restricted portions of northern Italy. Dry dark spots on the upper side of the leaf correspond to violet gray spots on the lower side. The latter are due to the fruiting organs of the fungus. Its mycelium ramifies in the leaf, which dries out, checking the growth of the tubers and materially diminishing the potato crop within the areas affected.

Does the potato scab organism survive passage through the digestive tract of domestic animals? W. J. MOORE (*Phytopathology*, 2 (1912), No. 4, pp. 146-149, pl. 1).—According to the author, it has been repeatedly demonstrated that the application of fresh stable manure to the soil immediately before planting often tends to increase the amount of scab on the resulting potato crop. From this the question has arisen whether it is safe to feed uncooked potatoes or potato refuse to animals in stalls without taking precautions to prevent uneaten portions from becoming mixed with the litter.

Experiments were carried on in 1910 and 1911 with a horse and a cow fed infected potatoes, and the results indicate that the germs of potato scab are able to pass through the digestive tract of both species and go into the manure pile without being destroyed. This was much more readily the case with the horse than with the cow. The manure of horses fed on raw potatoes is very likely to carry the germs of the disease. On the other hand, that from cows fed a moderate quantity of potatoes is probably not a serious source of contamination.

Diaporthe, the ascogenous form of sweet potato dry rot, L. L. HARTER and ETHEL C. FIELD (*Phytopathology*, 2 (1912), No. 3, pp. 121-124, figs. 4).—The authors report upon a study of specimens of sweet potatoes showing the typical dry rot described by Halsted (*E. S. R.*, 2, p. 416), where it is attributed to *Phoma batata*.

As a result of their study two strains of the fungus were obtained, and a careful investigation indicates that the pycnidial form does not belong to the genus *Phoma*. According to present classification it is thought more probably it should be referred to *Phomopsis*.

The characters of the ascogenous form of the fungus are described under the name *D. batatatis* n. sp.

Fruit tree enemies, Z. KAMERLING (*Bol. Min. Agr., Indus. e Com. [Brazil]*, 1 (1912), No. 2, pp. 58-62, pls. 4).—This is a study of the influence of parasitic plants (Loranthaceae) upon their hosts. Two branches of mistletoe were found to show a higher rate of evaporation, expressed in percentage of their dry weight, than were given by two branches of guava under similar conditions.

Apple leaf spot, C. BROOKS and MARGARET DE MERITT (*Phytopathology*, 2 (1912), No. 5, pp. 181-190, pl. 1).—The effect of this fungus on the fruit and the relation of limb cankers to the spread of the disease to the leaves and fruit have been previously noted (*E. S. R.*, 27, p. 651). In the present paper a report is given on the nature of apple leaf spot, on inoculation experiments to determine its cause, and on methods of control.

The apple leaf spot as it occurs in New Hampshire orchards is largely due to *Sphaeria malorum*. Several strains of this species may be obtained, varying in vigor and in power to produce diseased conditions. A large-spored form is principally responsible for the production of leaf spot. It is said that infection may occur from the time the leaves unfold until the last of August.

Experiments on the control of this disease, which included cutting out the cankers, plowing under the leaves, and spraying with Bordeaux mixture or lime sulphur showed that these methods are important in its control.

Watery apples, H. REICHE (*Deut. Obstbau Ztg.*, 1912, No. 1, pp. 16, 17; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 35 (1912), No. 20-40, p. 544).—The author reports his observations tending to show, it is claimed, that the glassy appearance of apples is produced by too strong manuring and too much moisture in the soil.

Watery or glassy appearance in apples, R. BORNE (*Deut. Obstbau Ztg.*, 1912, No. 1, p. 16; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 35 (1912), No. 20-24, p. 544).—Observations in 1911 led the author to the conclusion that excessive heat, as well as excessive moisture or manuring, plays a part in this disease. The glassy appearance showed at first in a small spot resembling frost injury, but spread rapidly. On sectioning the apples the cells appeared brown and soft. A considerable amount of injury due to this disease was noted.

Studies in gummosis and frost influence on cherry trees.—III. The artificial production of gummosis, P. SORAUER (*Landw. Jahrb.*, 42 (1912), No. 5, pp. 719-750, pl. 1).—Continuing previous work (E. S. R., 27, p. 851), the author presents the results of further experiments and observations with some suggestions.

In attempts to produce gummosis by artificial means it was found that a 5 per cent solution of ammonium sulphate placed beneath the bark of a healthy cherry tree produced a pronounced case of gummosis. The same result followed the introduction of oxalic acid, but such effect of this acid could be prevented or checked by addition of lime. Gummosis was not produced by employment of sulphuric acid or of any of several other salts tested. It is suggested that gummosis results from a sort of poisoning of the tissues by the chemicals used. In these experiments it is said that the growth of the twigs was accelerated but their maturity was retarded. This prolongation of the younger stage of the tissues, the increase and prolongation of activity of the tannic acid and cytase, and the depression of the pectase content may favor or condition the production of gummosis.

A new leaf rust of peach, S. HORI (*Phytopathology*, 2 (1912), No. 4, pp. 143-145, pls. 2).—The author describes a rust of the peach which is characterized by its white teleutosori, which distinguish it from the brown leaf rust (*Puccinia pruni-spinosae*) and yellow leaf rust (*P. cerasi*). The disease is usually confined to the leaves, which at first exhibit small purplish-brown spots. Later the spots change to light brown, and toward the end of October the leaves exhibit the white pustules mentioned above. The leaves soon become a yellowish brown and fall at the slightest touch. The trees become defoliated early in the season, the fruit is of poor quality, and the wood not properly matured.

The fungus, which is described as a new species, is given the name *P. pruni-perseae*.

The cause of the stem-end rot of citrus fruits, H. S. FAWCETT (*Phytopathology*, 2 (1912), No. 3, pp. 109-113, pls. 2).—In this paper the results of inoculation and other experiments are given which led to the determination of the cause of this rot as the fungus *Phomopsis citri* n. sp. Preliminary notes have been given on the disease (E. S. R., 27, p. 350).

A new internal Sterigmatocystis rot of pomegranates, S. M. McMURRAN (*Phytopathology*, 2 (1912), No. 3, pp. 125, 126).—A serious pomegranate disease in various parts of the United States was reported in 1910 and 1911, and early in November of last year a number of fruits were examined in this Department which showed a central cavity occupied by a black spore-forming fungus. Except in one instance, no external indication of decay was present. The fungus was isolated and determined to be *S. castanea*.

The author states that as the fungus generally shows no connection with the rind in the earlier stages of the disease it is probable that the spores must

gain entrance to the flower while the calyx is open. Experiments on the control of the disease are to be carried on to determine the accuracy of this view.

Observations on diseases of grapes in Sicily, L. PETRI (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 9 (1910), 1, No. 11, pp. 1-16, pl. 1, figs. 3; abs. in Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 20-24, p. 550*).—According to the author's observations, the disorders exhibited by Sicilian grape vines may be divided into four groups. Roncet constitutes the central disease of the first of these, being often complicated with such phases as root rot, insect injuries, etc. A second group is marked by no particular deformation, but by a retrogression and yellowing, often accompanied by root rot; the cause appearing to be poor condition of soil, as excessive moisture, chininess, etc. The third group appears in extended depressed spots in the vineyards, and seems to be connected with the presence of phylloxera. The fourth disease is also found in depressions and is ascribed principally to *Rhizopus lateifer*. In connection with each group, details are given and the effects upon different varieties are discussed.

Frizzle disease (court-noué) of grape, F. KOUR (*Allg. Wein Ztg., 29 (1912), p. 302; abs. in Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 20-24, p. 551*).—The author states that a disease of grapevines occurring near Mödling, Lower Austria, producing an appearance not unlike that due to roncet, was successfully treated during 1911 and 1912 by removal of the parts affected, the free use of sulphur in summer, and in the following spring the application of 4 per cent solution of lysol carefully painted on. The stocks not treated showed the disorder in high degree. The injury had been ascribed to the presence of *Phylloctes vitis*.

The life requirements of Peronospora as to weather, F. SÁVOLY (*Centbl. Bakt. [etc.], 2. Abt., 35 (1912), No. 17-19, pp. 466-473*).—This is an attempt to combine mathematically the factors operative in the development of *Peronospora*, as shown by observations, so as to express approximately the probable time of its appearance in vineyards.

Experiments on the pathological action of roncet, L. PETRI (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. C, 11 (1912), No. 4-6, p. 15*).—In connection with the claim (E. S. R., 28, p. 245) that roncet may be transmitted by grafting and with the hypothesis that this takes place by the agency of the sap, the author arranged some sound grafts on stocks affected with roncet so that the grafts while not in actual physical contact with the stocks, were bathed in their exuding sap, which was guarded from contamination. It is said that the shoots when developed showed the appearances characteristic of roncet.

In some other observations made by the author, the results seemed to show that some varieties of grapes possess a high degree of resistance to roncet.

The pathological significance of the endocellular fibers in grapevines affected with roncet, L. PETRI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 21 (1911), 11, No. 1, pp. 113-119; abs. in Internat. Inst. Agr. [Rome], Bul. Buc. Agr. Intel. and Plant Diseases, 3 (1912), No. 9, pp. 2091-2093*).—Continuing the above investigations on roncet, the author investigated the alleged effect of cold in the production of this disorder by subjecting young ungrafted potted vines from 8 to 15 times during 38 days to temperatures ranging as low as 5, 3, 0, and in exceptional cases -1° C., the outside temperature attaining sometimes about 30° C. in the sunshine.

Plants already affected with roncet showed increase of fibers in the xylem formed after the beginning of the experiment, and also formed fibers in the epidermal cells. Healthy vines for the first time formed the endocellular fibers said to be characteristic of roncet in the new growth appearing during the cooling period; but the characteristic court-noué was not produced, and the young vines showing these fibers appeared as healthy as others. Attention is

led to the fact that the formation of these fibers takes place in the vicinity of the nucleus.

The suggestion is made that the mild Italian winters, with short periods of cold in spring and fall while the tissues are growing and in a sensitive condition, may favor the formation of these fibers and the accompanying changes, their appearance being further favored by both local conditions of growth and constitutional peculiarities, the changes in protoplasm and sap being transmitted to the new growth in its first stage of formation.

Notes on three species of rust on *Andropogon*. W. H. LONG (*Phytopathology*, 2 (1912), No. 4, pp. 165-171).—An account is given of the results of inoculation experiments on various species of *Viola* with *Puccinia ellisiana* from *A. virginicus*, *Uromyces andropogonis* from the same species, and with *P. ellisiana* and *U. andropogonis* from violets sown on *A. virginicus*. The author shows the alternate host plants for the different species, and also discusses the relation of the aecidia on *Oxalis* to the *Puccinia* on *Andropogon*.

Exobasidium on Azalea. P. BACCARINI (*Bol. Soc. Bot. Ital.*, 1912, No. 6, pp. 127, 128; *abs. in Internat. Inst. Agr. [Rome], Bol. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 9, p. 2999).—The author reports serious damage done by the recent appearance of undetermined species of *Exobasidium* on leaves of Azalea near Florence. This disease is said to have been seen in Holland in 1903, near Rome in 1907, and in parts of Germany in 1908. It is thought to have spread from Holland through the trade in azaleas, which has its chief center in that country.

Wood rots of the hardy catalpa. N. E. STEVENS (*Phytopathology*, 2 (1912), No. 3, pp. 114-119, pl. 1, fig. 1).—In continuation of investigations on the wood rots of catalpa (*E. S. R.*, 27, p. 752), the author reports finding sporophores of *Polystictus versicolor* on dead timber of the hardy catalpa. In a study of this tree in Kansas he found at least 4 species, *P. versicolor*, *Polyporus adustus*, *Sclitophyllum commune*, and *Stereum albobadium*, on dead timber or on that which had been cut for some years.

P. versicolor is considered much more destructive under ordinary conditions than the others. In experiments with plugs of wood inoculated with fungi and placed in test tubes, *P. versicolor* occasioned a loss of 75 per cent of the original weight of the wood in 6 months, while under the same conditions *S. commune* caused a loss of only 37 per cent of the original weight.

The chestnut blight fungus and a related saprophyte. P. J. and H. W. ANDERSON (*Phytopathology*, 2 (1912), No. 5, pp. 194-199).—A detailed account is given of a saprophytic form of the chestnut blight fungus which has been observed in southwestern Pennsylvania (*E. S. R.*, 28, p. 153). The morphological, cultural, and pathological differences are described at some length and the distribution of the saprophytic form indicated. The article concludes with a discussion of the taxonomic relations of this species with that which is held to be the cause of the chestnut blight, *Diaporthe parasitica*.

The chestnut blight fungus. C. L. SNEY (*Phytopathology*, 2 (1912), No. 5, pp. 211, 212).—The author has made a study of the fungus in Europe, and as a result he is of the opinion that *Diaporthe parasitica* is the same as *Endothia pedicellata* of European authors. It is thought probable that it was introduced into this country from Europe and has gradually spread from the original point of introduction, its spread being facilitated chiefly by borers or other animal agencies which produce wounds favorable for infection by the fungus. Its attack on the American chestnut is believed to be due to the greater susceptibility of species in this country.

On the nature of nonparasitic 'itches' brooms. K. VON TUBBEF (*Naturw. Zechr. Forst u. Landw.*, 10 (1912), No. 1, pp. 62-64, fig. 1; *abs. in Centbl. Bak.*

[etc.], 2. *Abl.*, 35 (1912), No. 20-24, p. 576).—Continuing previous studies (E. S. R., 24, p. 453), the author investigated anew several conifers showing witches' brooms, but was still unable to find bacteria as the probable cause of the phenomenon, which he holds to be the result of mutation.

A Botrytis on conifers in the Northwest, J. R. WEIR (*Phytopathology*, 2 (1912), No. 5, p. 215).—A brief account is given of a species of *Botrytis* which resembles *B. dothidea*. It was noted as a serious disease on the young terminal shoots of Douglas fir, young shoots of *Abies grandis* and *Tsuga heterophylla*, and young seedlings of *Larix occidentalis*.

Edema on Manihot, F. A. WOLF and F. E. LLOYD (*Phytopathology*, 2 (1912), No. 5, pp. 131-134, pl. 1, fig. 1).—Attention was directed to a diseased condition of certain species of *Manihot*, commonly known as Ceara, growing in the greenhouse at the experiment station at Auburn, Ala. The leaves of a number of the plants showed peculiar glistening, prominent elevations, which occurred on either surface of the leaf. Sections through the affected areas showed no fungus, but there was a considerable enlargement and distortion of the cells, resulting in a condition generally described as that of edema.

Various views regarding the cause of this trouble are presented, and attention is called to the presence of the disease in the hope of receiving information concerning the occurrence of a similar trouble on Ceara grown in the field.

Bacterium prodigiosum causing red specks on fresh rubber, P. ARENS (*Centbl. Bakt. [etc.]*, 2. *Abl.*, 35 (1912), No. 17-19, pp. 465, 466).—The author claims to have shown by isolation and infection experiments that the red specks observed on freshly prepared India rubber are due to the presence of *B. prodigiosum*.

The chemistry and fungicidal action of Bordeaux mixture, C. T. GIMMELHAM (*Chem. World*, 1 (1912), No. 11, pp. 363, 364).—The author gives the results of a study of the chemistry and fungicidal action of Bordeaux mixture, paying particular attention to the processes by which the copper deposit is made soluble upon the leaves. He finds in practice that there will be comparatively little soluble copper produced by the action of carbon dioxide in the air and that while fungi may exert a solvent action sufficiently strong to kill an individual spore yet no general fungicidal action would come from such a means. His studies seem to indicate that most of the solvent action is due to exudations from injured foliage and that this must be taken into consideration in connection with scorching and other injury which often follows spraying.

In conclusion the author states that the most important factors concerned in the fungicidal action of Bordeaux mixture are not those by which soluble copper is produced, but that the actual contact, or close association between the fungus and the particles of the insoluble copper compound, is the chief means by which the mixture is effective.

The action of copper sulphate as fungicide, C. CAMPBELL (*Riv. Patol. Veg.*, 6 (1912), No. 15, pp. 225-229).—The author calls attention to the value of sulphate of copper combined with soap as used against *Peronospora* on grapevines, citing experiments by himself and others in support of a statement that this mixture is an effective and economical fungicide and that in fairly large doses it favors the physiological processes causing an increase in the yield. He employed a mixture of 0.5 per cent copper sulphate with three times as much soap in water, except for a first spraying or for a spray applied soon after flowering, when 0.3 per cent of the copper salt with a corresponding proportion of soap was used. The results are claimed to be more satisfactory than those from Bordeaux mixture as to spreading and sticking qualities, as protection against *Peronospora*, and in stimulating the plant to greater yield.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Annual report of the governor of Alaska on the Alaska game law, 1912. A. E. CLARK (U. S. Dept. Agr., Bur. Biol. Survey Circ. 90, pp. 14).—This report discusses the relative abundance of game, administration, hunting licenses, trapping licenses, receipts, and game or trophies shipped from Alaska. An address list of game wardens and licensed guides, information for the public in regard to the Alaska game law, and the regulations promulgated are appended.

Experiments in trapping moles, W. H. LAWRENCE (Washington Sta. Bul. 7, spec. ser., pp. 120, 121).—The author finds that as a general rule the most effective work is done during the early spring. His observations and experience have shown that it is a mistake to remove a trap from a runway as soon as a single mole is captured.

The cause determining the selection of food in some herbivorous insects, E. VIASCHEFFELT (K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 13 (1910), pt. 1, pp. 336-342).—This discussion relates particularly to *Pieris brassicae* and *P. rapae*, a leaf wasp (*Proctophorus padi*) the larvae of which live at the expense of the leaves of various Rosaceae, and a beetle (*Gastroides viridula*), the larvae and adults of which feed on the leaves of a species of *Rumex*.

Injurious insects, how to recognize and control them. W. C. O'KANE (New York, 1912, pp. XI+414, pt. 1, figs. 606).—The first part of this work (pp. 1-51) deals with the structure, habits, and classification of insects; the second part (pp. 53-104) with the methods of insect control; and the third part (pp. 105-379) with injurious insects. The more important insect pests are dealt with under the headings of insect pests of garden and field crops, orchard and small fruits, household and stored products, and domestic animals. In each of the first two groups the various species are arranged according to the place where they are found at work. It is stated that all the illustrations are original, having been prepared from photographs by the author.

Twelfth report of the state entomologist of Connecticut for the year 1912, W. E. BRITTON (Connecticut Sta. Rpt. 1912, pt. 3, pp. VIII+269-296, pls. 16).—The first part of this report briefly discusses the chief lines of work carried on during the year, entomological features of 1912, and the inspection of Connecticut nurseries and apiaries.

The inspection of Imported Nursery Stock in Connecticut (pp. 220-223) is reported upon by W. E. Britton and B. H. Walden; Gipsy Moth Control Work in 1912 (pp. 224-229) and Controlling the Brown-Tail Moth in 1912 (pp. 229-236) are reported upon by W. E. Britton and D. J. Caffrey; and A New Sawfly Pest of the Blackberry (*Pamphilius dentatus*), including a discussion of its life history and habits, and technical descriptions of its several stages (pp. 236-240), by B. H. Walden. The author is unable to state at the present time whether or not this pest will prove to be a serious enemy of blackberries.

A paper on The Life History and Habits of the Walnut Weevil or Curculio (*Conotrachelus juglandis*), by W. E. Britton and H. B. Kirk (pp. 240-253), includes a discussion of previous knowledge of the walnut weevil, its injury and abundance, technical descriptions of its several stages, food plants, control methods, distribution in North America, and a bibliography of 11 titles. In Connecticut the injury caused by the adults and larvae is confined entirely to the new growth and nuts, it causing the stems in extreme cases to be killed entirely back to the old wood and the nuts to fall before maturing. "The adults do their chief damage early in the spring, making large punctures, some of which go half way through the leaf stems and young shoots, causing them to wilt and die, and although the main injury is done by the larvae, the adult injury

would be worth considering. The larvae work first in the young shoots and later, as the stems grow, in the petioles of the leaves, in the leaf stems, or in fact any part of the new growth large enough to accommodate the larvæ. The injury to the new shoots by the larvæ, most severe in early summer and up to the middle of June, has been so great in the plantations . . . at Stamford and also with the trees at Lyme, as to wholly prevent the owners from obtaining a crop of nuts." This weevil appears to occur throughout the eastern half of the United States and Canada, though in a large portion of this territory it is not abundant and is not considered an important pest.

The walnut bud moth (*Aerobaxis carya* Grote?) is briefly discussed by H. P. Kirk (pp. 253-258). Examinations made at Stamford in connection with studies of the walnut weevil showed the larvæ of the walnut bud moth to be tunneling in the buds and new shoots and causing fully as much damage as the walnut weevil. At Stamford the damage to the Persian walnut (*Juglans regia*) was greater than that of the walnut weevil, and in a number of cases the young trees were killed in a very short time. The young butternuts, black walnuts, and several varieties of *J. regia* were damaged seriously. So far as could be determined it does not attack, or at least does not seriously injure, any of the other species of *Juglans*.

There are said to be at least 3 generations each season. The eggs are laid singly around the base of the bud and sometimes on the leaves. The larvæ habits of this insect are quite varied since they feed on buds, leaves, and stems. The nests, which are the most conspicuous evidence of the presence of this insect, contain most of the pupæ. The tachinid fly *Exorista pygæ* was reared from second brood larvæ. On trees sprayed with lead arsenate, 6 lbs. in 50 gal. of water, for the adults of the walnut weevil, no budworm injury was noticed.

A paper on The Mosquito Plague of the Connecticut Coast Region and How to Control It, which follows (pp. 259-263), has been previously noted as Bulletin 173 (E. S. R., 27, p. 559). An Outbreak of the Fall Army Worm is next reported upon (pp. 284-287). On September 3, larvæ were received from Stonington, where they were found devouring the grass of a lawn, and on September 10 from New Haven where they were also taken from a lawn. Serious injury by White Grubs is described (pp. 288-291), their injury in 1912 having far exceeded that of 1900 as previously reported (E. S. R., 23, p. 291). Cultivated crops such as strawberries, corn, and even potatoes, as well as grass were badly injured.

The report concludes with Miscellaneous Insect Notes, relating to a gall making beetle of the hop hornbeam, identified as *Agrilus champlaini*; the spruce bud moth (*Tortrix fumiferana*); a chrysomelid beetle on English ivy imported from Europe, identified as *Agelastion (Galeruca) alni*; the southern cabbage butterfly in Connecticut; *Tolyte ruficollis*, unusually common; the elm sawfly (*Cimex americana*); the potato aphid (*Macrosiphum (Nectarophora) solani-folii*); tulip tree scale (*Toumeyella liriiodendri*); juniper webworm (*Phalaena rutilana*); the garden millipede or "thousand legs" (*Julus hortensis*); mites on ash tree (*Tetranychus bimaculatus*); and mites on chrysanthemum flowers (*Tarsonemus pullidus*).

Fifth annual report of the state entomologist of Indiana, C. H. BALDWIN (Ann. Rpt. State Ent. Ind., 5 (1911-12), pp. 324, pls. 4, figs. 137).—The first part of this report consists of a large part of a general discussion of the more important insect pests occurring during the year, including remedial measures therefor. A popular account of the insects that affect the household and man is presented by H. F. Dietz (pp. 154-194), and a preliminary list of the plant lice or Aphididæ of Indiana, by H. Morrison (pp. 195-236). Accounts of some

important diseases of apple (pp. 239-270) and shade tree troubles (pp. 282-294) follow. The work concludes with a report of the division of apilary inspection, by J. W. Erbaugh and B. F. Kindig.

Observations and experiments on insect pests, W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser.*, pp. 102-105).—Kerosene emulsion applied as soon as the young made their appearance in the spring gave the best results in combating leafhoppers on blackberries in the open and nicotine fumigating paper gave good results in combating the pest on blackberry plants grown in the greenhouse for breeding purposes.

Experiments and observations made during 2 seasons are thought to justify the conclusions "that the cabbage maggot can be controlled by the use of various contact insecticides without injury to the older plants, at least provided the applications are thorough and timely in order that the eggs or the young worms are yet on the outside of the root. The shape of the root whether similar to that of the turnip or the cabbage, the date of planting versus the attacks of the pest, and the maturity of the plants modify conditions [and] in some cases determine the beneficial results following treatment."

Brief notes are given on the shot-hole borer and its injury to apples and grapes, and mention is made of a fungus which is associated with this borer.

Report on injurious insects in Finland, 1910. E. REUTER (*Landtbr. Stry. Meddel. [Finland], 1912, No. 8*), pp. 17, figs. 3).—This sixteenth annual report of the entomologist of Finland discusses the occurrence of the more important insect enemies of crops during the year 1910.

Insect enemies of cultivated plants in the German colonies, G. AULMANN (*Mitt. Zool. Mus. Berlin, 5 (1911), Nos. 2, pp. 259-273, figs. 14; 3, pp. 321-350, fig. 14*).—The first paper consists of a general account of the insect enemies of cotton, *Manihot glaziovii*, sesame, *Crotalaria grandibracteata*, mahogany (*Akaha senegalensis*), *Chlorophora excelsa*, and Bukoba coffee in German East Africa; the second paper deals with the insect enemies of cotton, coffee, and sorghum in the same colony. Among the more important pests considered are *Leucaanthostylum* which develops in the square and is an important enemy of cotton; *Xyleborus compactus* and *X. coffea* which bore in and cause the death of the branches of Bukoba coffee trees; *Idacantha magna* which injures coffee by feeding on the green berries and foliage; and *Bursicola sorghivida* which is the source of injury to sorghum through boring in the stalks.

Insects liable to dissemination in shipments of sugar cane, T. E. HOLLOWAY (*U. S. Dept. Agr., Bur. Ent. Circ. 165, pp. 8*).—The foreign insects mentioned as liable to be disseminated in shipments of sugar cane are the larger moth borer (*Costia licus*), weevil borers, froghoppers, leafhoppers, the pink mealy bug (*Pseudococcus sacchari*), the West Indian mole cricket (*Scapteriscus didactylus*), etc. The insects occurring in the United States enumerated are the sugar-cane moth borer, the gray mealy bug (*P. calceolaria*), the sugar cane aphid, etc.

Two enemies of tobacco (*Rhodesia Agr. Jour.*, 19 (1912), No. 2, pp. 179-180, fig. 3).—This paper relates particularly to the cutworms *Agrotis segetis* and *A. pyralis* and the splitworm or miner (*Phthorimaea operculella*).

Notes on the insect enemies of karite, A. and J. VUILLET (*Agr. Prat. Pays Chauds, 12 (1912), No. 117, pp. 436-448, figs. 9*).—The more important enemies of the shea tree (*Butyrospermum parkii*) here noted are the large bombycid *Cirina butyrospermi*, a pyralid (*Bostra* sp.), a cricket (*Pachytillus migratorides*), *Mussidia nigrivenella*, and a leaf miner.

On the resistance of *Cimex lectularius* to various reagents, powders, liquids, and gases, B. BLACKLOCK (*Ann. Trop. Med. and Par., 6 (1912), No. 4*,

pp. 415-428).—The author finds that insecticides in liquid and powder form are very limited in their utility in clearing houses of *C. lectularius*. Of the gaseous substances, sulphur dioxide is cheap and effective, killing when under pressure all stages in the cycle of development of the bug, including the egg, in 2 minutes.

Results obtained in the study of the frog hopper during the wet season of 1910, L. H. GOWEN (Dept. Agr. [Trinidad], Circ. 8, [1911], pp. 46, pls. 7, fig. 1).—Previously noted from another source (E. S. R., 25, p. 852).

Host index to California plant lice. II (Aphididae), E. O. ESSIG (Pomona Col. Jour. Ent., 3, [1912], No. 3, pp. 826-828).—This is supplementary to the index previously noted (E. S. R., 25, p. 149).

The aphids attacking cultivated peas and the allied species of *Macrosiphum*, E. V. THORNTON (Jour. Roy. Hort. Soc. [London], 38, [1912], No. 2, pp. 258, 257). The author finds that 3 species of aphids attack cultivated peas, namely, *Macrosiphum pisi*, *Megoura viciae*, and *Aphis rumicis*. He states that the green pea louse (*M. pisi*) occurs only on plants of the genus *Pisum*, *Lathyrus* (both wild and cultivated everlasting peas), and all 3 varieties of clover (*Trifolium*). This aphid passes the winter in Europe and northern parts of America in the egg stage on clovers and to some extent on wild and cultivated *Lathyrus*. In May and June the winged females fly to peas (*Pisum*) and there live until late summer, when they fly back to clovers and wild *Lathyrus*, and also to cultivated ones, where they later oviposit. *Megoura viciae* also winters on *Lathyrus* *sp.* *retrofractus*, and flies in spring to the peas and beans.

The Coccidae of Europe, North Africa, and western Asia, including the Azores, Canary, and Madeira islands, L. LINDNER (Die Schildläuse (Coccida) Europas, Nordafrikas und Vorderasiens, einschließlich der Azoren, der Kanaren und Madeiras, Stuttgart, 1912, pp. 388, figs. 36).—The first part (pp. 1-45) of this work, which consists of a general account of scale insects, includes tables for their separation from members of closely related families and for the subfamilies of Coccidae, with directions for their collection and study, etc. In the second or main part (pp. 47-346) descriptive tables are given under the various host plants and parts thereof by which the coccids recorded as infesting them may be identified. The third part (pp. 348-388) consists of a list of gall-forming coccids and their food plants, a list of the species not included in the second part, a locality index to the scales described, an index to the synonymy, an index to the valid species with the distribution thereof, etc.

Note on the biology of the genus *Septobasidium*, T. PERCH (Ann. Bot. [London], 25, [1911], No. 99, p. 833; abs. in Agr. News [Barbados], 12, [1913], No. 259, p. 17).—The author calls attention to the fact that fungi of this genus are parasitic on colonies of scale insects, which they overgrow and completely destroy. It is stated that one purple-black species which is fairly common on tea always grows over *Chionaspis bicalaris*. Examinations made in the Kew herbarium are said to show that this habit is not confined to Ceylon species since a sterile specimen from North America, included under *Thelophora lichenicola*, also shows a colony of scale insects beneath the subiculum. It is pointed out that these fungi do not live on the secretions of the insects, as in the case of *Meliola*, but upon the insects themselves.

The gipsy moth as a forest insect, with suggestions as to its control, W. F. FISKE (U. S. Dept. Agr., Bur. Ent. Circ. 163, pp. 20).—This circular discusses the parasites of the gipsy moth, the wilt disease, and the natural resistance of certain species of trees to attack by the gipsy moth, as applied to the management of forests.

It is stated that even the forests have suffered less from gipsy moth injury than early predictions would have led one to expect, the situation having be-

have measurably improved within recent years. "The real amelioration so perceptible in the metropolitan district, and distinctly in evidence everywhere, is due to at least 4 main causes: (1) The perfection and standardization of the methods for artificial repression; (2) the death of a large proportion of the susceptible trees or their removal from the infested woodlands; (3) the extermination of parasitic and predatory insect enemies; and (4) the development of the wilt disease."

Many of the promising species of gipsy moth parasites have now been imported and colonized under more or less satisfactory conditions in America; some additional work will be done toward assisting in the dispersion of certain species and possibly a new attempt will be made to import under more satisfactory conditions certain others which appear not to have established themselves as the result of earlier attempts. Otherwise the work of parasite introduction may be considered as completed.

It is further stated that the amelioration in conditions is due to the wilt disease more than to parasites. The author emphasizes the fact that the resistance of certain species of trees to injury by the gipsy moth is directly due to the susceptibility of caterpillars, feeding upon the foliage of these trees, and to death through the wilt disease.

Aspergillus infecting Malacosoma at high temperatures. W. P. GEE and A. B. MASSEY (*Mycologia*, 4 (1912), No. 3, pp. 279-281, fig. 1).—In cultural experiments the fungus *Aspergillus flavescens* was found to develop on the gipsy moth caterpillar only when the caterpillars were kept at a temperature of 37° C., in which condition the growth was rapid and fatal. The infection apparently took place from the germination of spores taken into the digestive tract of the caterpillar along with its food. In experiments conducted at other temperature none of the larvae, either sprayed or unsprayed, showed any signs of such infection.

The pepper tree caterpillar (*Bombycomorpha bifascia*). W. MOORE (*Agr. Soc. Union So. Africa*, 4 (1912), No. 4, pp. 539-542, figs. 5).—Pepper trees, which are commonly used as shade trees in the Transvaal, have for several years been regularly stripped of their leaves by this caterpillar. In this paper the author presents descriptions of the species with an account of its life history and means of control.

The apple and cherry ermine moths. P. J. PARROTT and W. J. SCHÖNKE (*New York State Sta. Tech. Bul.* 24, pp. 3-40, pls. 3, figs. 11).—The authors first give an account of the general characters of the ermine moths with historical notes and synonymy, attacks upon fruit trees, host plants, common names, economic importance, and distribution. Then follows an account of the biology of the ermine moths and of their occurrence in New York, notes on identity of apple trees, ermine moths on seedlings, and methods of control, and a synonymic bibliography of 9 pages.

"During recent years colonies of the caterpillars of the apple and cherry ermine moths have been discovered in considerable numbers in the State of New York. These insects were introduced in shipments of foreign nursery stock and appeared in plantations of imported apple and cherry seedlings. According to the records of the division of nursery inspection infested plants have been found at Lockport, Hilton, Chili, Dansville, Rochester, Penfield, Newark, Orleans, Seneca, and Geneva in western New York; at Johnston and Schenectady in the Mohawk Valley region; and at Blauvelt, in the Hudson River Valley.

"From the material that has been collected two species of moths were bred—*Panormicta malinellus*, which thrives largely on apple, and *P. padellus*, which

is a more general feeder, showing preference for hawthorn, plum, and cherry. Both species are common and destructive fruit pests in Europe. . . .

"In the studies on the life history of these insects during the past 4 years, the moths appeared during the first 2 weeks in July, and oviposition began about the middle of this month. The eggs are deposited in oval-shaped masses near a bud, usually of the current year's terminal growth, and less frequently on the older wood. Hatching takes place in early autumn and the young larvae remain through the winter under the protecting crust of the egg shells. In the spring they assemble among the tender leaflets of an adjacent bud, where they attack. The older caterpillars feed openly on the foliage under the protection of a thin, grayish web. With the need of more food they extend these webs, seizing and involving fresh leaves in a common nest. In severe attacks trees may be defoliated and completely covered with the silken tents of the insects. Pupation took place during the latter part of June and early July and the moths lived from the beginning of July to about the middle of August.

"These insects have, in their normal habitat, a large number of natural enemies, the most important of which belong to the orders Hymenoptera and Diptera. In spite of the large numbers of the moths' eggs imported into the United States, the lepidopterans were apparently unaccompanied by their more common and efficient parasites. An ichneumon, *Mesochorus* sp., was obtained from *padellus* reared on cherry, and a tachinid, *Erorista arvicola*, was quite abundant in some colonies of *malinellus* caterpillars subsisting on apple.

"Comparisons of the structures of the caterpillars and of the male genitalia show no tangible structural differences between *padellus* and *malinellus*. The absence of differential features suggests that the moths from hawthorn and cherry and those from apple constitute a single species; but cross-breeding experiments are desirable to settle definitely the status of the 2 forms.

"An outbreak of these insects is to be expected from 2 sources: (1) From the annual importation of infested foreign-grown nursery stock, and (2) from spread of the pests that may have established themselves along the avenues of trade in previous shipments. The remedy is careful inspection of nurseries during June and the destruction of infested plants. As fruit pests, the insects would prove amenable to prevailing spraying practices."

Papers on deciduous fruit insects and insecticides.—Life history of the codling moth in the Santa Clara Valley of California. P. R. Jones and W. M. Davidson (*U. S. Dept. Agr., Bur. Ent. Bul.*, 115, pt. 3, pp. 113-181, figs. 13).—The data here presented were collected in 1909 by D. Moulton and J. R. Horton, and in 1910 and 1911 by E. L. Young, the authors, and Miss Emma Weber. Seasonal history studies, band records, and weather records are reported, and natural enemies of the codling moth, first brood emergence versus overwintered emergence, 1911, and control of the codling moth on pears and apples in the Santa Clara Valley are discussed.

One full generation and one partial generation of the codling moth larvae occur in the Santa Clara Valley. A brief summary of its life cycle is given as follows: "The overwintered larvae pupate from the middle of February until May, the moths issuing about 6 weeks later through a period extending from the latter part of March until the middle of June. Eggs are deposited about 3 days after emergence, and these hatch in about 12 days, the red ring appearing in 2 or 3 days and the black spot some 8 days later. The first-brood larvae enter the fruit shortly after hatching and remain there for about 5 weeks. They are present in the fruit from the last week in April until the last week in July. . . . The first-brood pupal stage averages 21 days, only half as long as the corresponding stage of the spring brood, a fact due, undoubtedly, to the

considerably higher temperature influencing the former brood of pupae. First-brood pupae are present from about the middle of June until the middle of September, although the 2 years 1910 and 1911 show a considerable diversity in this point; for in 1910, the warmer of the 2 years, the first-brood pupae were present 3 weeks earlier. Similarly the first-brood moths emerged just so much earlier in 1910. A fair proportion of the first-brood pupae overwinter, and for this reason some individuals remain in the immature forms for 10 or 11 months. The first-brood moths begin to deposit eggs 3 days after issuing, and these eggs hatch in 11 days, or if the season is cold in 12 or 13 days. The red circle and black spot appear as in the first-brood eggs.

The second-brood larvae remain in the fruit about 50 days, and they are present from the latter half of July until the middle of October, a period of about 60 days, and thus shorter in comparison to the length of the larval stage than in the first-brood larvae. This is accounted for by the shorter period of adult emergence, causing a shorter period of egg deposition in the first brood moth as compared with that of the spring-brood moths. All larvae of the second brood winter over and form the great bulk of overwintering larvae. Doubtless if the fruit remained longer on the tree there would be a complete second brood possible, since so many varieties of apples and pears are picked before the end of September. In 1909 the second generation exceeded the first and this was a cold year, while in 1910 and 1911 the 2 generations were about equal in numbers, in spite of the fact that the former was a warm, the latter a cold year. In 1910 there was good reason to expect a large second generation, considerably greater in relation to the first generation than in 1911, but the relative proportions of the 2 generations was not maintained in 1910. Consequently it may be inferred that the weather does not always exert great influence on the relative sizes of the 2 generations any more than a large number of individuals of the first brood does on the second. . . . The larvae of the second brood are present in all but the earliest varieties of fruit, and it is necessary to combat them. . . . The sex of the moth can be determined in the larval stage by the presence or absence of the 2 testes, which are black and in the male show through the skin on the bottom of the eighth segment.

Three applications of the poison spray are necessary for the control of the codling moth in this locality. The first should be made immediately after the petals have dropped from the blossoms, the second should follow from 2 to 4 weeks later, and the third a month or 6 weeks after the second."

The oak tortricid in Italy (*Tertrix viridana*), G. CECCHI (Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 (1912), pp. 308-319, figs. 6).—Studies of the morphology, biology, and natural enemies of *T. viridana* are here reported.

Contributions to the knowledge of insect pests, P. SALVIGNI (Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 (1912), pp. 246-297, figs. 59). This third paper (E. S. R., 26, p. 147) treats of the 2 important lepidopterous enemies of the grape, *Polychrosis botrana* and *Cochylis ambiguella*.

On a mucedine parasite of the cochylis moth, G. FROX (Bul. Trimest. Soc. Sci. France, 28 (1912), No. 2, pp. 151-154).—In this second paper (E. S. R., 26, p. 56), the author states that the fungus which attacks the chrysalids of the cochylis and eudemis moths, previously described as *Spicaria verticilloides*, is a variety of *S. farinosa*.

The destructive Rhabdophaga of the willow in Italy (*Rhabdophaga salicivora*), G. CECCHI (Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 (1912), pp. 320-331, pl. 1, figs. 3).—Studies of the morphology, biology, and natural enemies of this cecidomyiid, which attacks the trunks and branches of various species of *Salix* in Italy, are here reported.

Contributions to the knowledge of the parasites of the olive fly, F. Sg. VERRI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici*, 6 (1912), pp. 176-203, pgs. 33).—This third paper (E. S. R., 25, p. 857) gives the results of studies of the morphology, biology, and natural enemies of *Oecophylla olivae neglectus*, a lepidopteron which mines in the leaves of the olive. The insect enemies of this miner, studies of which are reported, are *Eucyrtus mayri*, *Clerocerus formosus*, *Derocerus* sp., *Allogosoma variegatum*, *Sympiesis* sp., *Crucianix*, *Tetrastichus* sp., and *Eulophus longulus*, the last mentioned also parasitizing the olive fly (*Dacus oleae*) and *Tischeria camplanella*.

Revised keys to the species of mosquitoes and mosquito larvae found in New Jersey, H. R. WEISS and R. S. PATTERSON (*Ent. News*, 24 (1913), No. 2, pp. 65-74). This revision of the tables, published in the report on mosquitoes by J. B. Smith (E. S. R., 17, p. 56), is made necessary by descriptions of new species and various changes which have taken place in nomenclature and arrangement.

The sex of the larvae of mosquitoes and other experimental work, HELEN A. ADIE (*Lancet* [London], 1912, I, No. 13, p. 865).—The author in working with the anopheline mosquitoes has succeeded in distinguishing the male from the female larvae.

"On each side of the sixth abdominal segment of the anopheline larva can be made out, in males, a brownish oval tumidity. This can be seen with a two thirds or a hand lens; with practice the latter is sufficient for a fair-sized larva. With a two thirds it can be recognized on the third day. The brownish oval tumidity is the pear-shaped testis with its hard sac. On dissection it is found to be connected by a vas with a vesicula and ductus. It contains spermatozoa both formed and undeveloped. This test decides the question of the male sex. Twenty-four prognostications have come out correct on completion of metamorphosis. On dissection ovaries and spermatheca are quite clear in the female pupa, and in the case of the female larva rudimentary ovaries can be seen. In the *Culex* larva the testis has not the conspicuous brown color or the hard sac, and therefore is not so recognizable."

Note on the sex of mosquito larvae, HELEN A. ADIE (*Ann. Trop. Med. Parasit.*, 6 (1912), No. 4, pp. 463-466, pl. 1).—This is supplementary to the paper noted above.

Malaria control in California, H. F. GRAY (*Amer. Jour. Pub. Health*, 4 (1914), No. 6, pp. 432-435).—This paper deals with the work against anopheline mosquitoes.

The *Simulium pellagra* problem in Illinois, S. A. FOWNS (*Science*, n. s., 37 (1913), No. 942, pp. 86-91).—A paper read at the Second International Congress of Entomologists, at Oxford, England, on August 8, 1912.

House flies and how they spread disease, C. G. HEWITT (*Cambridge, Ent. Handb.*, 1912, pp. XII+122, pl. 1, figs. 19).—A popular handbook.

Some experimental observations upon monkeys concerning the transmission of poliomyelitis through the agency of *Stomoxys calcitrans*, M. J. ROSENBAUM and C. T. BRUCE (*U. S. Bul. Bd. Health Mass., n. ser.*, 7 (1912), No. 2, pp. 314-317; *Psychic*, 19 (1912), No. 6, pp. 191-194).—This is the paper that was presented before the Fifteenth International Congress of Hygiene and Demography, Washington, D. C., September, 1912, abstracts of which have been previously noted (E. S. R., 28, pp. 160, 161).

New North American Tachinidae, W. R. WALTON (*Ent. News*, 24 (1913), No. 2, pp. 39-52, pl. 1).—A tachinid parasite, reared from adult beetles of an undetermined species of *Laebnosterna* collected at Anasco, Porto Rico, in May, is described as *Eutritoides jonesii* n. g. and n. sp.

The rhinoceros beetle (*Oryctes rhinoceros*) in Samoa. F. P. JEPSON (*Dept. Agr. Fiji Bul. 3, 1912, pp. 25, pls. 8*).—This paper is based on an investigation extending over a period of some 4 weeks.

The infected area now extends from Luatuaumu, about 10 miles east of Apia, in a westerly direction around the coast to Safata on the south coast of Upolu, a distance of from 60 to 70 miles. In this area there are 2 localities which are particularly badly affected, namely, at Apia and Saleimoa. In these districts 75 per cent of the palms show signs of attack, 30 per cent of these having their yield affected. Only from 1 to 20 per cent of the trees are killed, and of these some have been killed by the natives in their search for specimens. In the other infected districts 25 per cent of palms are attacked, 10 per cent suffer injury to the extent of having their yield affected, while none of the trees have been killed. It is stated that the beetle is increasing in spite of control measures, and that the affected areas are becoming more extensive. Traps employed as artificial breeding places prove the most satisfactory means of dealing with the pest at the present time.

Morphological studies of bark beetles. I. G. FUCHS (*Morphologische Studien über Borkenkäfer. I, Die Gattungen Ips De Geer und Pityogenes Bedel. Habilitationsschrift, Grossherzogl. Bad. Tech. Hochschule, Filderichiana Karlsruhe, 1911, pp. 45, figs. 39*).—This first paper deals with the genera *Ips* and *Pityogenes*.

Morphological studies of bark beetles. II. G. FUCHS (*Morphologische Studien über Borkenkäfer. II, Die Europäischen Hylsinen. Munich, 1912, pp. 53, pls. 3, figs. 89*).—This second part deals with the European *Hylesinus*.

The palm weevil as sugar cane pest. L. H. GOWAN (*Dept. Agr. [Trinidad] Dec. 9 [1911], pp. 6, pl. 1*).—Previously noted (*E. S. R.*, 25, p. 855).

Injury to the walnut leaves and shoots by the walnut curculio, A. L. QUINANCE (*Proc. Ent. Soc. Wash., 15 [1912], No. 1, pp. 211, 212*). Reports of injury by *Conotrachelus juglandis* are said to have been received during 1912 from points in Pennsylvania, Maryland, and Connecticut.

The eggs are deposited in the shoots of various walnut trees from the first week in May until September. The larvae infest the swollen base of the leaf stalk and also hollow out the tender shoots. In addition to *Juglans cinerea*, the pest was found to attack large numbers of exotic walnut trees, including *J. regia*, *J. siboldii*, *J. cordiformis*, and *Hicoria minima*, and to have practically wiped out an orchard of *J. regia*.

On a new species of Curculionidae injurious to olives in South Africa. G. A. K. MARSHALL (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Sup. Agr. Portici, 6 [1912], pp. 3, 4*).—A weevil reared from South African olives, and which represents a new genus and species, is here described as *Anchonocecranus olea*.

Philippine Rhynchophora. K. M. HELLER (*Philippine Jour. Sci., Sect. D, 7 [1912], No. 5, pp. 295-316*).—This paper dealing with the Pachyrhynchidae of the Philippines includes tables for the separation of the genera and species. Seventeen species and varieties of Pachyrhynchus are recognized of which 12 species and 2 varieties are described as new to science. In addition 5 genera are characterized for the first time, namely Eupachyrhynchus, Pseudopachyrhynchus, Macropachyrhynchus, Nothopachyrhynchus, and Metapachyrhynchus, represented by 1, 5, 3, 3, and 6 forms, respectively, new to science.

The behavior of the honeybee in pollen collecting. D. R. CASTELL (*U. S. Dept. Agr. Bur. Ent. Bul. 121, pp. 36, figs. 9*).—This is a more detailed account of the subject than that previously noted (*E. S. R.*, 28, p. 62), and deals with the structures concerned in the manipulation of pollen, the pollen supply, the pollen-collecting process, the action of the forelegs and mouthparts, the middle

legs, and the hind legs, pollen moistening, and storing pollen in the hive. A bibliography of 14 titles is appended.

The fungi of the beehive, ANNIE D. BETTS (*Jour. Econ. Biol.*, 7 (1912), v. 4, pp. 129-162, figs. 28).—The author reviews previous work on the fungi of the beehive and gives description of 12 species of fungi, namely, *Pericarpotis alveolaris*, *Oospora favorum*, which are probably confined to the hive; *Gymnascus scabellus*, and perhaps *Eromascus fertilis*, which are adapted to hive life, but not confined to this habitat; *Penicillium crustaceum*, *Aspergillus glaucus*, *Citromyces subtile*, *C. glaber*, and *Mucor erectus*, common but not specially adapted to life in the hive; and *Aspergillus nidulans*, *Sordaria fimicola*, and *Gymnascus ruber*, occasionally present. A bibliography of 30 titles is appended.

The humblebee, its life history and how to domesticate it, with descriptions of all the British species of Bombus and Psithyrus, F. W. L. STOKES (London, 1912, pp. XIII+288, pls. 7, figs. 34; rev. in *Science*, n. ser., 37 (1913), No. 944, pp. 180-181).—This work, based upon observations extending over many years, takes up the subject under the heading of the life history of *Bombus*, *Psithyrus* the usurper bee, parasites and enemies of the humblebee, finding and taking nests, a humblebee house, domestication of the humblebee, how to distinguish the British species, making a collection, and anecdotes and notes. Seventeen species of *Bombus*, or true humblebees, and 6 species of *Psithyrus*, which comprise the parasitic humblebees, are described as occurring in the British Isles.

Among the data published for the first time are descriptions of the Sadek wooden cover for artificial nests and details of the author's humblebee house. It is stated that attempts made with queens to establish colonies artificially have been partially successful. The author's observations have shown that at least 2 of the species of *Psithyrus* here considered, namely, *P. rufestris* and *P. cecalis*, are deadly parasites of *Bombus lapidarius* and *B. terrestris*, respectively, in whose nests they live. The review is by W. M. Wheeler.

Geologic work of ants in tropical America, J. C. BRANNER (*Bul. Geol. Soc. Amer.*, 21 (1910), No. 3, pp. 449-496, pl. 1, figs. 11).—The first part of this paper (pp. 452-476) deals with the true ants, their abundance, destructiveness, attacks on man, beneficial ants, ants as food, structures above ground, underground work, and relations to the soil. The white ants or termites are then dealt with in a similar manner (pp. 476-492).

Ants and termites are vastly more numerous in tropical America than they are in the temperate regions. They show a marked preference for a clay soil since their structures stand up better on clayey than on sandy soils. They affect the geology, especially the soil and subsoil, both directly and indirectly: directly by their habits of making underground excavations that radiate from a central nucleus and often aggregate several miles in length, by opening the soil to atmospheric air and gases, by bringing to the surface large quantities of soil and subsoil, by introducing into their subterranean excavations large quantities of organic matter which must yield acids that affect the soil and the subjacent rocks, and by using these excavations for habitations and the production of gases that attack the soil and its contained minerals; indirectly, by the periodic passage and circulation of meteoric waters through their extensive tunnels, by affecting the availability of the soil for agricultural purposes and the habitability of the land by man, by the destruction of crops, and by the consumption (by termites) of dead plants and of timbers and lumber used in houses and for the manufacture of furniture, machinery, etc.

[**The work of ants and termites in China**], W. N. LACY (*Science*, n. ser., 27 (1913), No. 641, p. 57).—It is stated that a house occasionally attacked by white ants was completely rid of them through placing black ants' nests under the

and that this was accomplished without being inconvenienced in any way by the black ants.

As regards the attack of termites on living trees, it is said to be not at all common in China to find their mason work (passage ways built up the trunks of growing trees. An instance is cited of an olive tree that had been riddled by the white ants.

The pear slug (*Caliroa cerasi* [*Eriocampoides limacina*]), R. L. WEBSTER (*Ag. Sta. Bul.* 130, popular ed., pp. 3-8, figs. 4).—This is a popular edition of a Bulletin, previously noted (*E. S. R.*, 27, p. 459).

Australian Hymenoptera Chalcidoidea. I-III, A. A. GIRAUET (*Mem. Queensl. Mus.*, 1 (1912), pp. 66-189).—These three papers deal respectively with the families Trichogrammatidae (pp. 66-116), Mymaridae (pp. 117-175), and Elasmidae (pp. 176-189), presenting descriptions respectively of 10 genera and 39 species, 4 species and varieties, and 15 species, as new to science.

Basic slag successfully employed as an insecticide (*Jour. New Zeal. Dept. Agr.*, 5 (1912), No. 3, p. 217; *Ag. News [Barbados]*, 11 (1912), No. 278, p. 266).—This article relates to the employment, by J. P. Wagner, of basic slag as an insecticide. About 1,400 lbs. per acre applied on fields infested with the ear-beet plant louse prevented the insects from attacking the leaves and also gave them from the leaves already attacked.

FOODS—HUMAN NUTRITION.

The bacteriology of fermentation and putrefaction in relation to the conservation of foods, S. C. PRESCOTT (*Amer. Jour. Pub. Health*, 2 (1912), No. 11, pp. 834-839).—Some of the most important of the organisms concerned in food decomposition are noted.

These organisms are very numerous and induce many changes in food, but they are all destroyed by short periods of heating at 120° C., and their development is inhibited by temperatures of 0° or lower, the inhibition lasting only as long as the low temperature is maintained.

Physics of refrigeration, P. H. BRYCE (*Amer. Jour. Pub. Health*, 2 (1912), No. 11, pp. 829-833).—The problems involved in obtaining efficient refrigeration of food products are enumerated as "securing the nature, healthy, and sound food as free as possible, whether on the surface or in the deep tissues, from the effects of fermentation and putrefaction; the surrounding of the fresh products with pure air which contains always the normal proportion of oxygen, and the relative humidity at from 65 to 75 per cent; and the maintenance of the best degree of cold found necessary to preserve best any particular product."

The hygienic and economic results of refrigeration in the conservation of poultry and eggs, MARY E. PENNINGTON (*Amer. Jour. Pub. Health*, 2 (1912), No. 11, pp. 840-848, figs. 2).—The superiority of dry to wet packing for cold storage chickens is demonstrated, the methods being described in detail.

The loss of soluble proteins and nitrogenous extractives in the wet process is estimated at about 300 lbs. per carload, a loss in value of about 8450. The wet-packed chickens have a higher bacterial content at all stages of ripening, and their flavor is inferior to that of the dry-packed chickens. Dry packing necessitates mechanical refrigeration. This form of refrigeration is of still greater value to the egg industry. See also a previous note (*E. S. R.*, 24, p. 361).

Hygienic results of refrigeration in the conservation of fish and mollusks, H. D. PHASE (*Amer. Jour. Pub. Health*, 2 (1912), No. 11, pp. 849-854).—The author directs attention to the difference between refrigeration, that is, the application of degrees of refrigeration which will not freeze the fluids of the

tissues, and freezer storage, that is, the application of degrees of refrigeration sufficient to crystallize the fluids. The latter, though the more effective process, has been the more subject to adverse criticism.

Experiments in salt pickling. R. HORTINGER (*Ann. Escola Polytech. São Paulo*, 11 (1911), pp. 119-125).—Experiments in pickling meats and other products indicate that salt does not prevent microbial contamination.

A culture medium nearly saturated with salt did not prevent the development of micro-organisms. They became accustomed to the culture medium the more easily and the more rapidly the less the concentration, and once accustomed to the medium they developed and propagated just as in a normal culture medium.

The formation of δ -lactic acid in incubated hens' eggs. K. ANNO (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 89 (1912), No. 2-3, pp. 237-249).—The experimental data reported show that when eggs were incubated for 3 days a considerable quantity of δ -lactic acid was formed in the egg white and only a very small amount in the egg yolk.

The preparation and effect of the substances in rice bran active in polyneuritis. H. SCHALMANN (*Arch. Schiffs u. Tropen Hyg.*, 14 (1919), Beihft. 5, pp. 23-368; 15 (1911), No. 22, pp. 728-737; 16 (1912); 24, pp. 825-838; *Beihft. 1*, pp. 137-159; Nos. 11, pp. 349-361; *Trans. Soc. Trop. Med. and Hyg.*, 5 (1911), No. 2, pp. 59-75).—A substance was isolated from rice bran active in preventing or curing polyneuritis. The author considers this substance to be an activator.

In addition to this body, rice bran, according to the author, contains a poisonous substance, apparently cholin. The theory is advanced that the curative effects of the activator do not reside alone in the substance itself but rather that it assists in the building of compounds containing phosphorus, a view strengthened by the fact that the activator is found almost entirely in the pericarp of the rice grain, which is the principal phosphorus depot.

The results of an extended investigation are reported in these papers.

Some points concerning the treatment of wheaten flour. A. E. HUMPHRIES (*Rpt. Brit. Assoc. Adv. Sci.*, 1911, pp. 367, 366).—Some of the many chemical and physical problems encountered in the production of a uniform flour and a good quality of bread from a variety of wheats are stated.

Experiments on the digestibility of potatoes. M. HINDHEDE (*Scand. Acta Physiol.*, 25 (1912), No. 4-6, pp. 277-291; 28 (1912), No. 1-3, p. 16); *Ztschr. Phys. u. Diätet. Ther.*, 16 (1912), No. 11, p. 657).—In experiments covering 7 weeks, made with a 26-year-old man on a diet composed exclusively of potatoes, with butter, oleomargarine, or coconut fat, it was found that the potatoes were practically completely digested. The food, urine, and feces were analyzed.

Often nitrogen equilibrium was attained in 3 days with 5 gm. nitrogen in the food. In a supplement some data are given regarding an incomplete experiment with an American subject on a potato and butter diet, about 1,200 gm. of potatoes and an insufficient quantity of fat being eaten daily. Nitrogen equilibrium was not reached.

A study of canned vegetables. J. B. M. COEBERGH (*Pharm. Weekbl.*, 49 (1912), Nos. 20, pp. 429-431; 22, pp. 489-498, pls. 2; *abs. in Chem. Zentbl.*, 1912, II, A 4, p. 277).—Canned spinach was examined for the presence of tin, the amount found in 70 cans ranging from 0.02 to 0.5 gm. per kilogram.

Biochemical and bacteriological studies on the banana. E. M. BAILEY (*Jour. Amer. Chem. Soc.*, 34 (1912), No. 12, pp. 1706-1739; *Jour. Biol. Chem.*, 11 (1912), No. 2, *Proc.*, pp. XLII, XLIII).—From the bacteriological studies it appears, according to the author, that "the inner portions of the pulp of sound bananas are practically sterile, but that the regions of the inner coat

of the peel may be sparsely inhabited by bacteria, which, during normal ripening processes, are held in check but subsequently find conditions favorable to growth. The resistance of the protective covering of the fruit to invasion by bacteria points to the circulation of the plant juice as a more probable channel of infection, and suggests that infection occurs while the fruit is still on the tree.

The limited experiments with the organism of decay hardly justify the impression that it is specific for banana tissue. It can be said, however, that the bacillus readily produces decay, and, to the extent of the trials . . . described, exhibits a marked tendency toward a specific character."

The studies on ripening were summarized as follows:

"Amylase is present in the early stages of ripening and persists even in the unripe fruit. Its action could not be satisfactorily demonstrated previous to the first heating which initiates the ripening process. Sucrase is present in the unripe stage but is much more intense in the ripened fruit. Alkalinity retards or inhibits its action. The hydrolysis of raffinose by banana tissue is conclusively demonstrated. The specificity of the enzyme effecting this hydrolysis has yet to be established. The slight change undergone by maltose solutions under the influence of banana preparations does not warrant the unqualified assertion of the presence of maltase. No evidence of the presence of diastase or of lactase was obtained. A protease is present which appears to be of the erepsin type. Lipoclastic action was exhibited by both the unripe and ripe fruit. Peroxidase was found at all the stages of ripeness investigated."

"From the studies of carbohydrate formations in the banana, it appeared that the essential change during ripening is a conversion of starch into soluble carbohydrates which consist principally of cane and invert sugars and dextrins. Maltose is not present. An examination of the alcohol-soluble sugars by means of the osazone test failed to produce any maltosazone crystals. Galactans were not found in the unripe or ripe pulp or in the peel of the ripe fruit."

A study of nuts with special reference to microscopic identification. W. J. MYERS (U. S. Dept. Agr., Bur. Chem. Bul. 169, pp. 37, pls. 5, figs. 19).—The results are reported of a microscopic study of almonds, and their adulterants and substitutes (apricot, peach, and prune kernels), walnuts, hazelnuts, pine nuts, Brazil nuts, pistachio nuts, cashew nuts, and caranum nuts or Javanese almonds, the work being undertaken with special reference to the identification of nuts when pure or mixed with other nuts, and when in a comminuted condition. A key to species of nuts is provided, to facilitate the microscopic identification of those which are described.

Numerous illustrations supplement the text.

The possibility of tin poisoning from the use of coffee from tinned containers. H. STRUNK (*Veröffentl. Mil. Sanitätsz.*, 1912, No. 52, pp. 1-25; *abs. in Ztschft. Biochem. u. Biophys.*, 13 (1912), No. 14-15, p. 639).—Coffee infusion allowed to remain from 8 to 98 hours in a tin vessel contained no tin.

Beverages, past and present. E. R. EMERSON (*New York and London*, 1908, 2 vols., pp. VI+563; 2, pp. IV+514).—As noted in the subtitle, these volumes present a historical sketch of the production of beverages and a study of the customs connected with their use. The subject-matter is arranged geographically.

Report of the analyst. H. C. LYTHGOE (*Ann. Rept. Bd. Health Mass.*, 43 (1911), pp. 367-449).—Included in this report are data regarding the examination of a large number of samples of milk and miscellaneous food products, fats, and oils.

[Examination of foods, condiments, etc.], B. L. PURCELL (*Dept. Agr. 624 Immigr. Va., Dairy and Food Div. Bul. 29, 1911, pp. 84-125*).—A large number of analyses of miscellaneous food products, beverages, etc., are reported.

Report on bakeries and bakers in New York City. G. M. PRICE (*Prot. Rpt. Factory Invest. Com. N. Y. State, 1 (1912), pp. 201-268, pls. 11*).—A report is given of the sanitary inspection of 497 bakeries, with suggestions for remedying undesirable conditions where they existed. A bibliography is included as well as a summary of bakery legislation.

The problem of school lunches in Trieste. G. TIMEUS (*Il Problema della Razione Scolastica a Trieste, Trieste, 1910, pp. 131*).—In this article, printed from *Rapporto sanitario del Comune di Trieste*, the value of school lunches is discussed from the standpoint of social engineering. The author believes that the supplying of these lunches is not charity but justice.

School lunches in Trieste. G. TIMEUS (*Sul Servizio della Razione Scolastica nei Giardini d'Infanzia del Comune di Trieste, Trieste, 1910, pp. 16*).—An article reprinted from *Rapporto sanitario del Comune di Trieste*.

The new ration supplied at noon to the children attending the Children's Guardian Schools is designed to furnish to children from 3 to 6 years of age one-half of the nutritive material they require per day. The average ration contains 27.25 gm. protein, 13.29 gm. fat, and 101.69 gm. carbohydrates, and supplies 651.89 calories of energy. Detailed information is given regarding the quantity and kind of food supplied each day of the week in winter and in summer and the amounts of various foods required per hundred rations. The method of making the soup which constitutes a portion of the ration is described, as well as information regarding the source of supply of the foods and the examination of the milk.

Changes in prices and in household expenditures in Paris. D. DE BERNONVILLE (*Bul. Soc. Sci. Hyg. Aliment., 1 (1911), No. 5-6, pp. 544-575, figs. 7*).—A study of the cost of living in Paris.

Practical cooking and serving. JANET MCK. HILL (*New York, 1912, 12 XVIII+679, pls. 79, figs. 61*).—In addition to a large collection of recipes, this volume contains discussions of marketing, the functions of food, providing a well balanced menu or dietary, and similar questions.

Fine cookery. WILHELMINE VON BRESSLAU (*Die Musterküche, Stuttgart, 1912, pp. 135*).—Menus, with recipes for each day in the year, are given, with additional recipes.

A new book of cookery. FANNIE M. FARMER (*Boston, 1912, pp. XVII+145, pls. 8, figs. 226*).—An extended collection of recipes, with descriptive text.

The preparation of food. ALICE RAVENHILL (*Brit. Columbia Dept. Agr. Bul. 56, 1912, pp. 20, figs. 61*).—This bulletin, similar in scope to some of the Farmers' Bulletins of this Department, is designed for general distribution.

Labor-saving devices in the household. ALICE RAVENHILL (*Brit. Columbia Dept. Agr. Bul. 51, 1912, pp. 28, figs. 14*).—Similar in scope to the above.

Increasing home efficiency. MARTHA B. and R. W. BACHAR (*New York, 1912, pp. 8+318+81*).—Among the chapters included in this discussion of home problems are the basis of efficiency, chance versus the budget, home administration of the home and the market, training the consumer, the cost of children, and savings and efficiency.

House sanitation. MARION TALBOT (*Boston, 1912, pp. VIII+116, figs. 7*).—This volume, which has been prepared as a manual for housekeepers, is designed to replace an earlier volume entitled *Home Sanitation*, by Ellen H. Richards and Miss Talbot.

The volume has been entirely rewritten and much new material added. The chapters deal with such topics as the new sanitation, the responsibility of the

housekeeper, situation of the house and care of the cellar, plumbing, air and sanitation, heating, light and lighting, furnishing, the country house, and household control of infection.

An index is provided and also a bibliography.

The diastatic power of human saliva, G. HIRATA (*Biochem. Ztschr.*, 47 (1912), No. 2, pp. 167-183).—According to the experimental data reported, the diastatic power of saliva does not vary materially during the day and is not influenced by the time of eating or the kind of food. It is not dependent upon the quantity secreted, nor, with the exception of nursing infants, is it affected by the sex or age of the subject.

Contributions to the physiology of the stomach.—I. The character of the movements of the empty stomach in man, A. J. CARLSON (*Amer. Jour. Physiol.*, 31 (1912), No. 3, pp. 151-168, figs. 8).—Movements of the empty stomach were studied in a subject with a fistula. The stomach pulse and factors affecting it are discussed at length.

As the author notes, the subject's stomach, when empty, "is never completely quiescent, at least during the first 24 hours after an ordinary evening meal or supper. For even should the 20 seconds rhythm be shown to be a pylorus rhythm, this activity of the pylorus could probably not go on without considerable tonus of the fundus musculature. It is not improbable that this persistent motor activity of the empty stomach is present only in vigorous individuals."

Concerning the cause of intestinal movement, W. WEHEND (*Pflüger's Arch. Physiol.*, 147 (1912), No. 3-5, pp. 171-196, figs. 12).—In the author's opinion, the experimental data reported show that the intestinal wall contains a substance which excites the Auerbach plexus, and it may be assumed that the anatomical elements of the intestine are of chemical origin.

The protein element in nutrition, D. MCCAY (*London, 1912*, pp. XV+216, pls. 8).—This volume, which is one of the International Medical Monographs, presents an exhaustive summary of the author's very extended investigations and the work of others bearing upon the importance of protein in the diet. The material is discussed with reference to low protein theories, with which the author does not agree.

The following chapter headings show the scope of the work: The food of mankind, tropical food materials and their digestibility, the protein metabolism of mankind, the protein requirements of mankind, the merits and demerits of diets poor in protein, the effects of a low protein dietary in the Tropics, and the effects of the level of protein metabolism on the physique and general efficiency of different tropical tribes and races.

Some of the author's investigations with native races in India have already been noted (*E. S. R.*, 25, p. 167), and the results of later work on the effects of Bengal food materials on pigeons are briefly summarized. The author concludes that none of the Bengal foodstuffs caused polyneuritis, neither the dals used in Bengal nor the Indian or country rice. "It is evident, therefore, that the absence of the beriberi vitamin in their dietary is not the explanation of the poor physique of the Bengalis."

With reference to his purpose and conclusions, the author states that in the present volume he has made use "of the observations and investigations of a host many of the more important recent publications on the subject, and has attempted to show that the weight of evidence is entirely against the great debilitation of the protein content and caloric value of the diets of mankind so strongly advocated. . . .

"Recent investigations by different research workers have shown that it is possible to reduce very considerably the quantity of protein necessary to maintain an animal in nitrogenous equilibrium, when the particular nitrogenous

compounds required by that animal only are given in the food. In fact, at the present time, no one denies the feasibility of maintaining either man or animals in a condition of nitrogenous equilibrium on quantities of protein very much below the standards set up by the old masters in the science of nutrition.

"If we knew exactly how much, and what particular nitrogen compounds the body requires in each specific state of nutrition, it is rational to expect that it would be possible to maintain the body in health, vigor, and efficiency on quantities of protein very much less than those hitherto considered necessary; but as we do not know what form of nitrogen combination nor how much of any particular unit is required in the different states of bodily nutrition, it is surely only rational that, in order to insure a sufficiency of those elements absolutely essential, a liberal standard of dietary should be recommended. . . .

"It seems, therefore, only reasonable to lay down such a standard of protein in the feeding of man as will at least give to the body the opportunity of obtaining the particular combinations it requires in any given state of nutrition.

"This deduction is fully borne out by a careful consideration of the information available from dietary studies carried out in many different countries, and particularly by the investigations made in India to determine the effects of different degrees of protein interchange on several tribes and races living under exactly the same conditions, except as regards diet. An absolutely dispassionate survey of the physical development and general capabilities of the race, and people of India points undoubtedly to the conclusion that, other factors being eliminated, those who obtain a liberal supply of absorbable protein in their daily food are superior in every respect to those whose dietaries exhibit any marked degree of lowering of the average protein standard.

"The general conclusion arrived at, from a broad consideration of all the facts available in the present state of our knowledge, is that the views held by the older writers on nutrition are sounder and more in accord with the findings of careful scientific study than are those of the newer school."

Photographs of Indian natives used to low and abundant protein rations elucidate the text, and an index is provided.

On heat coagulation of proteins, HARRIETTE CHICK and C. J. MARTIN (*Brit. Med. Assoc. Adv. Sci.*, 1911, pp. 281-286).—The processes of heat coagulation of protein, consisting of denaturation, a reaction between protein and water, and agglutination, the subsequent aggregation of the altered protein complexes, are described. The reaction rate of denaturation, the relations of temperature and denaturation, the effect of acidity on denaturation, the progressive diminution of acidity during the denaturation of egg albumin, the effect of neutral salts upon the rate of denaturation, and the effects of various acids and salts and of temperature on agglutination are discussed.

Experiments with dogs fed gelatin, ammonium salts, products of meat which had undergone complete cleavage, and a mixture of all known amino acids, E. ARDERHALDEN and P. HIASCH (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 81 (1912), No. 4, pp. 323-328).—The experiments clearly showed that the crepton and ammonium acetate differed decidedly in their effects. The crepton induced gains in weight, while no gains were made but rather a considerable loss in weight was noted with ammonium acetate fed with gelatin.

The fate of prolin in the animal body, H. D. DAKIN (*Jour. Biol. Chem.*, 1913, No. 4, pp. 513-516).—Perfusion experiments with a surviving dog's liver did not lead to an increase in the normal formation of acetoacetic acid, nor was the acetoacetic acid excretion of glycosuric animals markedly increased by the administration of prolin. "It is clear, therefore, that prolin is not to be classed with phenylalanin, tyrosin, or leucin in having acetoacetic acid for a common catabolic path."

On the other hand, an administration of prolin to a glycosuric animal was found to result in a marked increase in sugar output, so that it would appear that prolin should be grouped with glutamic and aspartic acids, alanin, and glycine, which, with other bodies, are capable of furnishing glucose.

The chemic problem in nutrition. J. ACLE (*Philadelphia, 1912*, pp. XV+29, pls. 2).—As the subtitle, magnesium infiltration, indicates, the author has presented in this volume data regarding magnesium metabolism and theories which he has deduced.

Contributions to the etiology of beriberi. W. P. CHAMBERLAIN, E. B. VEDRICK, and R. R. WILLIAMS (*Philippine Jour. Sci., Sect. B, 6 (1911), Nos. 3, pp. 215; No. 5, pp. 395-401; 7 (1912), No. 1, pp. 39-52*). The authors have experimentally shown that polyneuritis of chickens and beriberi result from deficiency of some substance, not phosphorus, in the diet, and that rice polishings contain a substance which prevents such disease. The experiments with fowls here reported indicate that the theory that beriberi is caused by acid fermentation of rice by saprophytic bacteria in the kernel is untenable.

The following substances were found useless in the prevention of beriberi: nitrogenous compounds such as arginin, histidin, asparagin, various amino acids, lecithin and cholin lipoids, and extract of onions. The neuritis preventing substance which occurs in rice bran is insoluble in ether. It is absorbed by animal charcoal, after which maceration of the charcoal with water, absolute alcohol, or ether, does not remove the neuritis preventing substance, nor is it present in the filtrate. Edema was not produced in fowls suffering from polyneuritis by ingestion of large amounts of sodium chlorid. They were protected by administering 5 cc. of an extract of rice polishings, but 2.5 cc., equivalent to 2.5 gm. of polishings, failed to protect them from polyneuritis.

Respiration experiments in man in the fasting condition and after the administration of various proteins. W. LOEFFLER (*Pflüger's Arch. Physiol., 2 (1912), No. 3-5, pp. 197-214*).—The spirometer results described agree completely with those obtained by other observers with respiration apparatus. In the same person, the results remain constant for more than 4 years. On administration of 50 gm. of caseinogen or of edestin, the gaseous metabolism increases by about 5 gm. of both oxygen and carbon dioxide.

Has the temperature of the food any influence on the gaseous metabolism of man? P. HÁRI and S. VON PESTHY (*Biochem. Ztschr., 44 (1912), No. 1-2, pp. 6-39; abs. in Jour. Chem. Soc., [London], 1912, No. 699, II, p. 952*).—Lowering of from 0.25 to 0.8° in the body temperature results from taking 1 liter of milk at 4° C., while a liter at 50° C. causes a rise in temperature of from 0.12 to 0.40°, lasting for some time.

Both the hot and cold milk cause an increased oxygen consumption of from 3 to 15 per cent, which ceases after 3 hours in the case of the hot milk, but lasts for several hours longer in the case of the cold milk, due, apparently to the longer time required to empty the stomach after cold milk ingestion. From the result of an experiment on one individual it was found that almost twice as much nitrogen is excreted in the urine after cold as after hot milk is taken. **The heat of respired air.** LECFECLE (*Compt. Rend. Acad. Sci. [Paris], 154 (1912), No. 23, pp. 1528, 1529; abs. in Chem. Zentrbl., 1912, II, No. 19, p. 852*).—The construction, calibration, and method of using a thermopile for determining the amount of heat removed by respired air are described.

Effect of sterilization of the surroundings, the air breathed, and the food eaten, upon the digestion and the metabolism of animal organisms. MAXIMIN (*Jour. Physiol. et Path. Gén., 13 (1911), No. 5, pp. 689-694, fig. 1; 14 in Hyg. Rundschau, 22 (1912), No. 21, p. 1353*).—Experiments with rab-

bits, dogs, pigeons, rats, and guinea pigs indicate, in the author's opinion, that the presence of saprophytic bacteria in the air, food, and surroundings is indispensable to the life of the animal organism.

The death which comes quickly to the sterilized animals is not due merely to digestive troubles, but to changes in metabolism. They can not perform complete combustion of nitrogenous substances, and show a diminution of Robin's coefficient (uric nitrogen plus total nitrogen) and an abundant excretion of leucanins. It is believed that bacteria coming from without the organism bring with them oxidizing ferments which are taken up by the leucocytes when they absorb the bacteria, the ferments being utilized by the organism to obtain complete combustion.

The influence of carbohydrates on energy metabolism, P. HÄR (Biot. Ztschr., 44 (1912), No. 1-2, pp. 66-83).—The heat production and gaseous metabolism of dogs were measured by the Rubner respiration calorimeter and the Zuntz-Geppert apparatus.

From the increase of oxygen consumed and the heat production, the conclusion was drawn that after oral ingestion of sugar a large proportion is immediately metabolized and not stored as glycogen in the liver. The ingestion of dextrose sufficient to cover from 50 to 80 per cent of the energy needs of the organism of a fasting animal was accompanied by an increase in the heat production.

[A calorimeter for the measurement of] mental and muscular fatigue J. S. MacDONALD and J. E. CHAPMAN (Rpt. Brit. Assoc. Adv. Sci., 1911, 174, 175). The respiration calorimeter recently constructed at Sheffield University, England, is very briefly described.

So far it has been used only as a calorimeter. The authors claim to have found a method of measuring the heat output without measuring the rate of flow of the cooling water. For estimating the body surface of human subjects the formula $S = .201 W^{\frac{2}{3}}$ has been adopted, in which S represents the body surface area, H the height, and W the weight of the subject.

ANIMAL PRODUCTION.

Annual reports of the American Breeders' Association (Ann. Rpts. Amer. Breeders' Assoc., 7-8 (1911-1912), pp. 533, pgs. 98).—This publication contains the proceedings of the association, including the following papers which have reference to the breeding of animals: Breeding Experiments with Sheep, by T. R. Arkell (pp. 256-260), previously noted (E. S. R., 25, p. 573); Fecundity in Swine, by Q. I. Simpson (pp. 261-266), noted on page 574; Analytical Hybridizing, by Q. I. and J. P. Simpson (pp. 266-275), noted on page 574; The Bred Foxes of St. Paul and Otter Islands, Alaska, by J. Judge (pp. 275-279); A Study of the First, Second, and Third-Year Egg Production of White Leghorn Hens, by Clara Nixon (pp. 279-288), noted on page 577; The Behavior of Inheritance of the Unit-like Series, by H. H. Laughlin (pp. 304-312), noted below; An Algebra of Mendelism and its Application to a Mixed Hybrid Population, by A. W. Gilbert and G. B. Upton (pp. 312-320), noted below; The Teaching of Genetics, by C. I. Lewis (pp. 327-329); Genetics in the College Curriculum, by A. T. Wiancko (pp. 329-330); Inheritance of Mammary Size, by E. N. Wentworth (pp. 545-549), noted on page 574; Nutrition as a Factor in Fetal Development, by J. M. Eward (pp. 549-550), noted on page 574; Further Report on Inheritance of Horn and Wool Covering in Sheep, by T. R. Arkell (pp. 561-568), previously noted (E. S. R., 28, p. 267); Dual Purpose and Fat Fat Production, by E. N. Wentworth (pp. 568-571); and Segregation in Cattle, by E. N. Wentworth (pp. 572-580), noted on page 572.

The behavior in inheritance of the unit-like series. H. H. LAUGHLIN (*Ann. Rpt. Amer. Breeders' Assoc.*, 7 (1911), pp. 391-312).—A demonstration that in the analysis of biological pedigrees the neat fitting of facts is not a sufficient proof of location of a genetically independent unit.

An algebra of Mendelism and its application to a mixed hybrid population. A. W. GILBERT and G. B. UPTON (*Ann. Rpt. Amer. Breeders' Assoc.*, 7 (1911), pp. 312-329).—An illustration of a method of calculating the possibility of Mendelian inheritance by the laws of chance and the algebra of permutations and combinations. It is stated that this method possesses advantages over the geometric and other methods because of the simplicity of presentation, speed of calculation, and the flexibility and power of analysis.

The influence of suprarenal glands on growth. F. DE MIRA (*Compt. Rend. Soc. Biol. [Paris]*, 73 (1912), No. 29, pp. 377-379).—A brief report of experiments with cats and dogs, which indicate that the secretions of the suprarenal glands stimulate growth in the animal body and particularly in the skeletal system.

Investigations on natural diets and the alimentary canal of mammals. A. MAGNAN (*Ann. Sci. Nat. Zool.*, 9. ser., 16 (1912), No. 1-4, pp. 206-247).—This contains tabulated data on the weight of the stomach, weight, length and surface of the intestine, and the weight and length of the cecum in different classes of mammals.

New experiments on the function of the corpus luteum. L. FRAENKEL (*Arch. Gynäkol.*, 91 (1910), No. 3, pp. 705-761; *abs. in Fortsch. Med.*, 29 (1911), No. 11, pp. 255, 256; *Jahrb. Wiss. u. Prakt. Tierzucht*, 7 (1912), pp. 165, 167).—Experiments on a large number of animals lead the author to conclude that the corpus luteum causes changes in the uterus which attract and cause an attachment of the egg.

Critical studies on sexual trimorphism. E. WEISSER (*Kritische Studien über den Sexual Trimorphismus. Inaug. Diss., Univ. Bern*, 1910, pp. 99).—A discussion of primary and secondary sexual characters and a study of the effects of castration on man and domesticated animals. Measurements of castrated horses, cattle, and swine are presented in tabular form.

A bibliography is appended.

Sterility and impotence in male domestic animals. T. H. DALE (*Vet. Jour.*, 77 (1912), No. 450, pp. 671-686).—This discusses the causes of sterility and the use of aphrodisiacs.

The feeding value of potato stalks and berries. W. VOLTZ (*Ztschr. Spiritus-Indust.*, 35 (1912), Nos. 28, pp. 377, 378; 29, pp. 389, 390; 30, pp. 404, 405; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intei. and Plant Diseases*, 3 (1912), No. 9, pp. 2027, 2028).—In experiments with sheep both dried potato seed balls and ground potato stalks were found to be a satisfactory feed when mixed with hay.

The manufacture of sugar from wood, and its economic importance. A. ZIMMERMANN (*Jour. Roy. Soc. Arts*, 61 (1912), No. 3133, pp. 69-81).—A brief description is given of the Classen process of treating sawdust so that 25 per cent of sugar is formed from other carbohydrates, with a discussion of the value of the resulting product as a feeding stuff. Four lbs. of the product, known by the trade name of "sacchulose," was used to replace 4 lbs. of oats in the daily ration for horses. At the end of about 7 months the 4 horses had gained on an average 52.5 lbs. in weight.

Report of commercial feed stuffs. J. E. HALLIGAN (*Louisiana Stas. Feed Stuffs Rpt.*, 1911-12, pp. 122).—This contains the annual report of feed inspection for the season 1911-12. Analyses are reported of cotton-seed meal, cotton-

weed feed, rice bran, rice polish, wheat bran, wheat shorts, corn chop, molasses feed, hominy feed, brewers' grains, beef scrap, tankage, alfalfa meal, screenings, and proprietary mixed feeds.

The increased cost of meat, MAIER (*Deut. Schlacht u. Viehhof Ztg.*, 12 (1912), Nos. 50, pp. 756-759; 51, pp. 771-774; 52, pp. 785-788).—This contains statistics on meat production and the price of meat in Germany from 1906 to 1912.

Segregation in cattle, E. N. WENTWORTH (*Ann. Rpt. Amer. Breeders' Assoc.*, 8 (1912), pp. 572-589, pgs. 14).—This contains data additional to those previously noted (E. S. R., 26, p. 667), with a discussion of results of Mendelian inheritance as regards horns and coat color.

The application of the theory of probability in investigations on the solid-color East Friesian cattle, E. HEUBELT (*Mitt. Landw. Inst. Breslau*, 8 (1911), No. 3, pp. 425-448).—Measurements of East Friesian cattle are presented in tabular form, and the results treated by biometrical methods. The origin of these cattle are also discussed.

Beef production, H. R. SMITH (*Nebraska Sta. Bul.* 132, pp. 52, figs. 6).—To test the value of corn silage for beef production in summer, 6 groups with 8-9 month-old grade steers in each group were fed for 20 weeks 3 days, beginning March 25. The gains and cost per head and day were as follows: On corn, alfalfa, and shredded corn stover there was a gain of 1.52 lbs., at a cost of 5.42 cts. per pound; on corn, alfalfa, and corn silage 1.85 lbs., at a cost of 4.96 cts.; on corn, wheat bran, and silage 1.4 lbs., at a cost of 5.91 cts.; on corn, linseed meal, and silage 1.51 lbs., at a cost of 5.63 cts.; and on corn, cold pressed cottonseed cake, and silage 1.45 lbs., at a cost of 6.9 cts. per pound. The last lot received all the grain it would eat, whereas the other 5 lots were given about two-thirds as much.

On August 15, 1911, the supply of silage gave out and prairie hay was substituted for it in all groups mentioned above, with the following results during a period of 16 weeks: Corn, alfalfa, and corn stover 1.76 lbs., at a cost of 7.94 cts.; corn, alfalfa, and prairie hay 1.81 lbs., at a cost of 8.41 cts.; corn, wheat, bran, and prairie hay 1.55 lbs., at a cost of 10.07 cts.; corn, linseed meal, and prairie hay 1.74 lbs., at a cost of 9.43 cts.; corn, cold-pressed cottonseed cake, and prairie hay 1.59 lbs., at a cost of 9.72 cts.; and corn, cold-pressed cottonseed cake, and prairie hay 1.67 lbs., at a cost of 10.82 cts.

In a 100 day test in which corn silage was compared with corn stover with the same cattle when more mature, the following results were secured: On alfalfa, a light feed of corn, and a heavy feed of corn silage there was a gain of 1.49 lbs., at a cost of 10.69 cts.; on alfalfa, a medium feed of corn, and a medium feed of corn silage 1.72 lbs., at a cost of 10.35 cts.; on alfalfa, a heavy feed of corn, and a light feed of corn silage 2.11 lbs., at a cost of 9.27 cts.; and on alfalfa, a heavy feed of corn, and a light feed of corn stover 1.89 lbs., at a cost of 11.24 cts. per pound.

To secure data on the quantity of corn which can be most economically fed with silage and alfalfa to calves, a mixed lot of 32 calves weighing from 200 to 500 lbs., was divided into 4 groups. The average daily gains for 4 months on the different rations were as follows: On alfalfa and a heavy feed of corn silage (16.64 lbs. per day) 1.36 lbs., at a cost of 4.1 cts. per pound; on alfalfa, a heavy feed of silage (12 lbs.), and a light feed of corn (3 lbs.), 1.71 lbs. at a cost of 5.44 cts.; on alfalfa, a medium feed of silage (9 lbs.), and a medium feed of corn (6 lbs.) 1.91 lbs., at a cost of 5.7 cts.; and on alfalfa, a light feed of silage (6 lbs.), and a heavy feed of corn (9 lbs.) 2.26 lbs., at a cost of 6.14 cts. per pound.

A study of the separate records of the animals used in the above experiments showed that the variation in gains was fully as great within one breed as between representatives of different breeds.

Type or conformation seems to be a controlling factor, the low-set, more compact types having something of an advantage in gains and much in early maturity over the range types. Gains seem to correlate to a considerable degree with body capacity as indicated by the size of the middle girth, the best gainers having relatively larger middle girths at the same weight in most instances. While the average gains made by all dairy bred steers are nearly the same as those made by the beef bred steers up to the age of 23 months, the latter showed in most instances a higher condition of flesh, a greater proportion of high-priced meat, and sold for a higher price per hundred, securing larger profits to the feeder on the basis of the same initial cost per hundred."

Wintering pregnant ewes in Alabama. D. T. GRAY and L. W. SHOOK (*Alabama Col. Sta. Bul.* 167, pp. 267-270, figs. 7).—Pregnant ewes could not maintain their normal health and weight on a ration of sorghum hay, or on cotton seed and a small amount of cotton-seed meal, or on mixed hay consisting of beans, cowpeas, and crab grass. A daily ration of 0.54 lb. of cotton-seed meal and 1.87 lbs. of hulls produced satisfactory gains, but a ration of cotton-seed meal and corn silage also produced satisfactory gains at less cost.

A comparison of Cotswold and Southdown grade lambs.—Fattening rations for aged ewes, A. D. FAVILLE (*Wyoming Sta. Bul.* 35, pp. 15, figs. 1).—Twenty Cotswold grade lambs, the birth weights of which averaged 9.3 lbs., reared on a ration of alfalfa, roots, corn, and oil cake when they had reached over 80 lbs. in weight. The average daily gain was 0.46 lb. per head during a period of 49 days. A similar lot of Southdown grade lambs averaged 8.8 lbs. at birth, and gained 0.44 lb. per head and day during the feeding period. The dressed weight of the Cotswolds was 50.72 per cent and of the Southdowns 53.59 per cent. The average weight of the Cotswold fleeces was 5 lbs., 6 oz., length of staple 4.1 in., and shrinkage of fleece 43.3 per cent. The average weight of the Southdown fleece was 5 lbs., 2.4 oz., length of staple 5.5 in., and shrinkage of fleece 50.7 per cent.

The fattening ewes were fed different kinds of hay in connection with corn cobs. Their gains per head and day for a period of 70 days were as follows: alfalfa hay, 0.19 lb.; native hay, 0.14 lb.; and oat hay, 0.13 lb.

Value of Angora goats in land clearing. W. H. LAWRENCE (*Washington Sta. Bul.* 7, spec. ser., p. 129).—On recent work in land clearing by means of Angora goats, continuing former work (*E. S. R.*, 39, p. 570), the best results have been secured by slashing the field, constructing a goat-proof enclosure, and confining therein a sufficient number of animals to keep down the sprouts of the secondary growth.

Ration experiments with swine. A. D. FAVILLE (*Wyoming Sta. Bul.* 36, pp. 6).—Six shoats weighing about 43 lbs. each made an average daily gain of 0.47 lb. per head on a ration of corn and middlings. A similar lot on the same ration, but with access to pea pasture, made an average daily gain of 0.68 lb. per head, and another lot on rape pasture in addition to corn and middlings made an average daily gain of 0.49 lb. In a subsequent period, when all lots were put on grain alone, those which had been on pasture made faster gains than the first lot.

In a test lasting 69 days, 6 pigs weighing about 120 lbs. on a ration of corn made an average daily gain of 1.2 lbs. per head; a similar lot on corn and middlings a gain of 1.13 lbs.; and another lot on corn and alfalfa a gain of 0.71 lb. per head. The crossbreds made somewhat faster gains than pure-bred Duroc

Jerseys. Both rape and pea pasture were found to be valuable supplements to maintenance rations for brood sows and both effected a large saving of grain. Alfalfa hay was also found to be a good ration for the brood sow.

Pork production without milk or potatoes. A. GOVIN and P. ANTONIO (*Jour. Agr. Pract., n. ser., 24* (1912), No. 46, pp. 428-436).—In a 4 weeks' feeding test with 2 pigs averaging 110 lbs. on a ration of skim milk (first week only through mistake), meat meal, peanut cake, copra cake, wild carob beans, and a small quantity of ground green bone the average daily gain was 1.51 lbs. each.

Garbage piggeries. A. W. BROWN (*Amer. Jour. Pub. Health, 2* (1912), Vol. 12, pp. 939-946, fig. 1). A description of a successful plant for a more economical method of disposing of city garbage than burning.

Analytical hybridizing. Q. I. and J. P. SIMPSON (*Ann. Rpt. Amer. Breeders' Assoc., 7* (1911), pp. 266-275, figs. 8). This is a discussion of some unit characters in swine.

Fecundity in swine. Q. I. SIMPSON (*Ann. Rpt. Amer. Breeders' Assoc., 7* (1911), pp. 261-266). A brief report on experiments in swine breeding. It is thought that fecundity can be increased by feeding the sow on highly nitrogenous food for some time before serving.

Inheritance of mammae in swine. E. N. WESTWORTH (*Ann. Rpt. Amer. Breeders' Assoc., 8* (1912), pp. 545-559). A statistical study of the inheritance of about 290 animals, although this number was not deemed large enough to obtain correlations of much significance. The following results are noted:

"The excess of males with reference to living pigs was 2.02 per cent. . . . In 30 per cent of the sows the number of teats giving milk and suckling pigs was equal. In 63.34 per cent the milking mammae exceeded the number of pigs and in 6.66 per cent the pigs exceeded the functional mammae in number. In the latter class there was one more pig for one sow and an excess of two for the others; in the second class the total number of pigs was 71.51 per cent of the total number of functional mammae. . . . The totals with the pigs show 130 pigs with symmetrical mammae and 68 pigs with asymmetrical mammae. When divided according to the odd or even number in the parent, the proportion still holds, 35:68 in the offspring of asymmetrical sows.

"It seems to the writer that there are at least two factors operating and that one of these is rather complex in make-up. The first, and complex perhaps, is the simple addition or subtraction of pairs of mammae from parents to offspring, and secondly a restriction factor which prevents the development of one nipple of the normal pair."

Nutrition as a factor in fetal development. J. M. EYVARD (*Ann. Rpt. Amer. Breeders' Assoc., 8* (1912), pp. 549-569). This contains data additional to those previously noted (E. S. R., 27, p. 279). The vitality of the pigs seemed to be to a great extent dependent upon the rations fed to the mother, as shown from the following table, the lots being arranged in decreasing order of relative vigor:

Vigor of offspring of brood sows in percentages of total births.

Ration.	Strong.	Medium.	Weak.	Total.
	Per cent.	Per cent.	Per cent.	Per cent.
Ear corn and meat meal 1:30.....	93.18	4.55	2.27	100.00
Ear corn and alfalfa in racks.....	89.47	7.89	None.	97.36
Ear corn and meat meal 1:30.....	91.89	5.41	2.70	100.00
Ear corn and clover in racks.....	96.75	None.	6.25	103.00
Ear corn, oats, bran, middlings, oil meal.....	87.12	5.66	8.66	101.44
Shelled corn, chopped clover, molasses.....	85.71	None.	11.43	97.14
Ear corn alone.....	68.42	18.79	15.79	102.99

The 4 lots producing the largest and strongest pigs at birth were likewise the cheapest producers, the cost per pound ranging in these lots from 7 to 14 cts., as compared with 23 cts. when corn was fed alone. The pigs from the lots receiving meat meal had longer, denser, and brighter cherry-red coats than did the pigs from the other lots. "The pigs from the sows receiving nothing but corn did not show nearly so heavy and glossy colored coats as the other lots and this was attributed to the following observed factors: (1) The skin underlying the coat was lighter—approaching a colorless skin—and of a somewhat anemic condition. This would tend to make the coat appear less highly colored than if the skin were pink and rosy as in lot 3. (2) There was really less coat because of a smaller number of hairs per unit area, and further because the hairs were comparatively short. The apparent differences in coat color were really due to differences in quantity of hair and color of background due to a fundamental difference in color of the hairs themselves."

The practical significance of these results and those obtained by other investigators in feeding brood sows are discussed.

Notes on horse colors, C. E. WOODRUFF (*Jour. U. S. Cavalry Assoc.*, 23 (1911), No. 24, pp. 699, 700).—Evidence is presented in addition to that previously noted (E. S. R., 26, p. 75) concerning the superiority of white-haired horses for withstanding extremes of heat and cold, and their inferiority where there are no extremes of temperature.

The histology of the oviduct of the domestic hen, F. M. SURFACE (*Maine Agr. Bul.* 206, pp. 395-430, pls. 5).—This is a detailed account of a study of the microscopic anatomy of the structure of the oviduct of the domestic fowl, which was made in order to understand the physiology of the albumin, membrane, and shell formation in the making of an egg.

The results are summarized as follows: "Two muscular layers, an outer longitudinal and an inner circular layer can be distinguished in all parts of the oviduct. The inner surface of the oviduct is thrown into a number of primary longitudinal ridges. The epithelium over these ridges forms secondary folds. In the uterus the ridges as such are lost and instead there are a number of leaf-like folds of the inner surface.

"Three types of glands are described: (1) Unicellular epithelial glands occurring between the ciliated cells in all parts of the oviduct except the anterior portion of the funnel. (2) Glandular grooves. These are accumulations of gland cells at the bottom of the grooves between the secondary folds of the epithelium. These are found only in the funnel region. But there they occur well toward the anterior end. The presence of glandular structures in the funnel region has not hitherto been recognized. (3) In all parts of the oviduct between the funnel and the vagina there is a thick layer of glands beneath the epithelium. I have called these tubular glands. They consist of long convoluted and branched tubules which open to the lumen of the oviduct by short epithelial ducts. These tubular glands are homologous, structurally at least, with the glandular grooves of the funnel. The tubular glands reach their greatest development in the albumin secreting region. Histologically the unicellular epithelial glands present a similar appearance in all parts of the oviduct except the vagina. In this latter region the cells are longer and much narrower and have a slightly different arrangement than in other parts of the oviduct.

"The walls of the tubular glands consist of large gland cells which in the albumin portion and the isthmus of a laying hen have small, irregularly shaped, dark staining nuclei which lie well toward the basal ends of the cells. In these two regions the protoplasm of the cells consist of rather coarse granules which vary greatly in size.

"The line of demarcation between the albumin region and the isthmus is characterized by the absence of these tubular glands in that region. The cells of the tubular glands in the albumin region and in the isthmus present the same histological appearance.

"In the uterus the cells which form the tubular glands have a somewhat different appearance. The nuclei of these cells are large with regular outlines and are situated near the center of the cells. The protoplasm is very finely granular and is quite different from the coarsely granular condition found in other parts of the oviduct.

"The tubular glands or any homologous structures are entirely absent from the vagina. Only the unicellular epithelial glands occur here."

In the last section of the paper some suggestions are offered as to the probable function of the various glandular structures in the different parts of the oviduct. A bibliography is appended.

The mode of inheritance of fecundity in the domestic fowl, R. PEARL (*Maine Sta. Bul.* 265, pp. 283-337, figs. 3; *Jour. Expt. Zool.*, 13 (1912), No. 2 pp. 153-268, figs. 3).—A detailed account of the results of an investigation into the inheritance of fecundity of the domestic fowl, which has now involved 13 generations and several thousand individuals. The basic data as derived from trapnest records of (a) pure Barred Plymouth Rocks, (b) Cornish Indian Games, (c) the F_1 individuals obtained by reciprocal crosses of these 2 breeds, and (d) the F_2 individuals obtained by mating the F_1 inter se and back upon the parent forms in all possible combinations.

The work as a whole shows that the record of the fecundity of a hen taken alone is not a reliable indication of the probable egg production of her daughters, and that mass selection on a basis of fecundity records of females alone fails to produce any change in type in the direction of selection. But fecundity is inherited in some fashion, and the ways in which it might be inherited are discussed in detail.

The number of visible oöcytes in the ovary were counted and were found to bear no constant relation to the actually realized egg production, which means that the observed differences in egg production depend on differences in the complex physiological mechanism concerned with the maturation of the oöcytes and ovulation.

Winter egg production was found to fall into 3 well defined classes, (a) birds with high winter records, (b) those with low winter records, and (c) those which did not lay at all in the winter period. The division between (a) and (b) for Plymouth Rock stock falls at a production of about 30 eggs.

The results are accounted for by the Mendelian hypothesis as follows: There were found to be 3 distinct and separately inherited factors upon which fecundity in the female fowl depended. The first of these, which may be called the anatomical, determines the presence of an ovary. The other two are separate physiological factors. "The first of these (denoted by L_1) is the basic physiological factor, which when present alone in a zygote with F brings about a low degree of fecundity (winter record under 30 eggs). This factor is under no limitations in gametogenesis but may be carried in any gamete, regardless of what other factors may be also present. The second physiological factor (denoted by L_2) when present in a zygote together with F and L_1 leads to a high degree of fecundity (winter record over 30 eggs). When L_2 is absent, however, and L_1 is present the zygote exhibits the same general degree of fecundity (under 30) which it would if L_1 were present alone. These two independent factors L_1 and L_2 must be present together to cause high fecundity, either of them alone, whether present in one or two 'doses,' causing the same degree of low fecundity.

The second physiological factor I_2 behaves as a sex-limited (sex-correlated or sex-linked) character. In gametogenesis, according to the following rule: The factor I_2 is never borne in any gamete which also carries F . That is to say, all females which bear I_2 are heterozygous with reference to it. Any female may be either homozygous or heterozygous with respect to I_1 . Any male may be either homozygous or heterozygous with reference to either I_1 , I_2 , or both."

This interpretation throws light on the earliest selection experiments at the station, and shows why the immediate constitution of the male plays so important a part in determining the fecundity of the daughters. It is pointed out that for the improvement of the race by breeding attention must be given to the gametic condition, rather than to the somatic characters, of the parent stock. Though it is stated that somatic conditions may play a part in any well considered system of breeding for a particular hen, blind mass selection on the basis of somatic characters only is essentially a haphazard system of breeding, which may or may not be successful in changing the type.

A bibliography of 53 titles is appended.

The inheritance of fecundity, R. PEARL (*Pop. Sci. Mo.*, 81 (1912), No. 1, pp. 361-373).—In this paper, which was read at the First International Eugenics Congress, the author discusses the anatomical basis of fecundity and the mechanism of inheritance of fecundity as measured by winter egg production of fowls, based on work noted above. Some possible applications from these results to the science of eugenics are pointed out.

A study of the first, second, and third-year egg production of White Leghorn hens, CLARA NIXON (*Ann. Rpt. Amer. Breeders' Assoc.*, 7 (1911), pp. 276-288).—A statistical study of egg production in White Leghorn hens, with the following results:

Modes and constants of variation in egg production.

Period of egg production.	Modal class.	Mean.	Standard deviation.	Coefficient of variability.
Total egg production per hen (3 years).....	153-200 200-225 225-300	271.507 ± 6.1366	83.340 ± 4.7395	31.428 ± 1.7368
Egg production per hen for first year of laying.....	100-125	92.614 ± 2.6925	36.571 ± 1.8394	39.487 ± 2.5077
Egg production per hen for second year of laying.....	50-75	95.455 ± 2.7839	38.720 ± 1.9687	40.564 ± 2.3770
Egg production per hen for third year of laying.....	75-100	87.784 ± 2.4463	34.023 ± 1.7300	38.758 ± 2.2477

The coefficients of correlation were as follows: Total production per hen for 3 years and first year production, 0.7501 ± 0.0314 ; total production for 3 years and second year production, 0.8491 ± 0.0201 ; total production for 3 years and third year production, 0.6240 ± 0.0439 ; first year and second year production 0.5484 ± 0.0503 ; first year and third production, 0.1530 ± 0.0702 ; second year and third year production, 0.3973 ± 0.0606 .

The practical conclusion drawn from these figures is that the first year egg record was a fairly safe basis as a selection of second year layers. Neither the first year nor the second year record could serve as a satisfactory basis for the selection of the third year flock, although it is stated that with hens kept under different conditions, with different methods of feeding, or with other breeds, different results might be obtained.

Investigations on the causes of the formation of silky and woolly feathers in fowl, F. TAUBERT (*Untersuchungen über die Ursachen der Seiden- und Wollfiederbildung bei Hühnern als Beitrag zur pathologischen Entstehung von Rasse-*

Merkmale. Inaug. Diss., Univ. Bern, 1919, pp. 89, pls. 3).—A study of feather development, from which it is concluded that the silky and woolly feathers are pathological conditions due to environment, and are examples of the inheritance of acquired characters which give origin to racial characteristics.

A bibliography is appended.

Statistical contributions to poultry breeding (*Wiener Landw. Ztg., 62* (1912), No. 95, pp. 1095, 1096).—This contains statistics on the poultry industry of the world.

Experimental pheasant breeding. ROSE H. THOMAS (*Proc. Zool. Soc. London, 1912, 111, pp. 539-546, pls. 4*).—A continuation of earlier work (E. S. R. 25, p. 879). From results obtained with crosses of *Phasianus formosus* and *P. versicolor* the following conclusions are drawn:

"The male parent transmitted to his F₁ female offspring much of the female plumage of his species and the dimension of the egg. The female parent transmitted to her F₁ male offspring much of the male plumage of her species. In the F₂ generation, the offspring of F₁ female X Versicolor male, the Versicolor male seems to have transmitted every character—bill, leg color, plumage, habit and temperament—of the female of his species to his F₂ female offspring, while he has not transmitted every character of the male of his species to his F₁ male offspring; repeating exactly the results of the original experiment with *gemmaus*."

DAIRY FARMING—DAIRYING.

The influence of breed and individuality on the composition and properties of milk. C. H. ECKLES and R. H. SHAW (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 156, pp. 27*).—These studies were made in connection with those previously noted (E. S. R. 28, p. 479), using the same animals, the same ratios and the same methods of sampling.

The average percentage of total solids in the milk of 3 Jerseys was 14.0, 13.34, and 15.02, respectively; in 2 Ayrshires, 12.08 and 12.71; in 3 Holsteins, 12.12, 10.73, and 11.35; and in 3 Shorthorns, 13.08, 13.01, and 12.17. The average percentage of fat was as follows: In 3 Jerseys, 4.87, 4.64, and 5.36; 2 Ayrshires, 3.51 and 3.85; 3 Holsteins, 3.23, 2.63, and 3.1; and 3 Shorthorns, 3.89, 4.13, and 3.37. The average percentage of casein in 3 Jerseys was 2.93, 2.65, and 3.13; 2 Ayrshires, 2.62 and 2.81; 3 Holsteins, 2.49, 2.11, and 2.49; and 3 Shorthorns, 2.74, 2.87, and 2.62. The average percentage of total protein in 3 Jerseys was 3.7, 3.27, and 3.97; in 2 Ayrshires, 3.11 and 3.33; 3 Holsteins, 3.27, and 3.21; and 3 Shorthorns, 3.4, 3.49, and 3.28. The relation of fat to casein showed but little variation within the breed, but the Jersey milk contained relatively more fat than the other breeds.

The average percentage of sugar for each cow was as follows: Three Jerseys, 4.85, 4.95, and 4.8; 2 Ayrshires, 4.85 and 4.96; 3 Holsteins, 5.05, 4.26, and 4.25; and 3 Shorthorns, 5.04, 4.91, and 4.98. The other constants are given in the following table:

Average chemical and physical constants of the milk fat by breeds.

Breed.	Relative size of fat globules.	Iodin number.	Saponification number.	Reichert-Meissl number.	Melting point.
Jersey	328	30.52	228.9	26.73	52.0
Ayrshire	150	31.61	228.2	25.93	50.0
Holstein	142	34.20	229.1	25.46	47.0
Shorthorn	282	34.36	227.6	26.28	50.5

breed was apparently a factor in the size of the fat globules, the Reichert-Meissl number, and the iodine number. There was little difference due to breed or individuality in the saponification number, and the melting point of the fat showed no variation that could be attributed to breed and but little to the individual animals. With the exception of the size of the fat globules, the fat constants are considered to be far less influenced by breed and individuality than by stage of the lactation period. The feed, also, is considered a greater factor than breed or individuality in influencing the nature of the fat.

Variations in the composition and properties of milk from the individual cow. C. H. ECKLES and R. H. SHAW (*U. S. Dept. Agr., Bur. Anim. Indus. Bul.*, 17, pp. 27).—This contains data obtained in connection with the work noted above showing the variations of individual cows.

One of the most striking results obtained was the slight variation from day to day in the percentage of protein. More than 90 per cent of the analyses showed a variation of less than 0.2 per cent from the average of the animal supplying the samples, and no sample showed a variation of more than 3 per cent from the average. The percentage of sugar varied only a little more than that of the total protein. In the case of the fat the extreme variation reached almost 2 per cent. Only 56 per cent of the samples came within 3 per cent of the average, showing that the sample taken from a single milking is of little value as an indication of the percentage of fat in the milk of any one cow.

In determinations of the Reichert-Meissl number 58 per cent varied less than 1 from the average, showing that fluctuation was quite marked. The iodine number varied even more, and there was also considerable variation in the saponification number; 62.2 per cent varied less than 2 from the average. There seemed to be no relation between the iodine number and the amount of fat or any other constituent. An increase in the iodine number in most cases was accompanied by a decline in the Reichert-Meissl number and in the saponification value. The melting point did not vary to any great extent; 65 per cent of all samples varied less than 1 degree from the average.

In comparing morning and evening milk, the chief differences were in the Reichert-Meissl number, which was higher in the morning, and the iodine number, which was higher in the evening milk. The fat content was slightly higher in the morning milk. Samples from 2 animals which were milked 3 and 4 times daily showed wider variations than those from the cows milked twice daily, although no appreciable variation was found in the total protein, sugar, or ash. The only striking difference between the first and last drawn milk was the percentage of fat and the size of the fat globules, both being larger in the last drawn. The Reichert-Meissl number, iodine number, and saponification number were generally lower in the strippings than in the first milk. The detailed analyses of the milk used from the 7 cows in this investigation are presented in tabular form.

Experimental studies on milk. E. H. SCHOKER (*Jour. Infect. Diseases*, 11 (1912), No. 3, pp. 295-337).—A study of the different grades of milk and the effect of storage upon certified, inspected, and pasteurized milk, based on daily variations of samples covering a period of 10 months.

Tests are reported for acidity, fermentation, and sediment, also bacterial counts at the time the samples were taken and after storage for a varying length of time. Some of the results are as follows:

"Our better classes of milk contain little sediment, market milks containing more dirt but fewer cells than certified milks. The Tromsdorff tube is a convenient method for examining for dirt and cells. . . . Cream on rising carries with it a large portion of the bacteria in milk. Separator cream does

not take with it as large a portion of the bacteria as does gravity cream. . . . Of the bacteria in good milks about 30 per cent were acid producers, while 20 per cent of those in inspected and 30 per cent of those in certified and pasteurized milks were protein digesters. At the higher temperatures fermenting organisms increased more rapidly in certified milk, but at the lower temperatures the most marked increase was observed in pasteurized milk. The percentage of peptonizing types increased only at low temperatures. Apparently gravity cream contains the larger portion of peptonizing forms, while the skimmed milk below contains most of the fermenting forms when milk has been refrigerated.

"In a lactose medium 41.43 per cent of certified, 55 per cent of inspected, and 84 per cent of pasteurized milks produced gas. Certified milk did not contain bacteria producing hydrogen sulphid and indol as frequently as did inspected and pasteurized market milks. Milk from definitely diseased quarters is less acid than from healthy quarters. . . . Coagulation occurred as soon after delivery in pasteurized market milk as in raw milk. . . . When clotting had occurred the curd was most acid. The straw-colored fluid under the cream is an evidence of peptonization and was not as acid in reaction as the curd and whey. Gravity cream, above the skimmed milk, was as acid as the skimmed milk as long as the acidity of the mixed milk was not high. . . . Protein decomposition without coagulation occurred principally at a temperature near the freezing point. Adding an equal part of 68 per cent alcohol to milk is an easy and reliable test for the detection of beginning acidification. The tests for catalases and reductases are of much value. The catalase and slow reductase tests are of assistance in detecting old milk, and the hastened reductase test offers a convenient and reliable method for detecting and testing the efficiency of pasteurization. Gravity cream carries with it a large portion of the ferments of milk.

"The fear of putrefying organisms in pasteurized milk is not warranted as far as market milk pasteurized by the holding method is concerned. Where predominance of putrefying bacteria is not the only objection to pasteurized milk, it has been an important one. Certified milk, because it contains but little cow manure, is infected principally with spore-bearing organisms; it is always well refrigerated, and contains as large a percentage of protein-digesting and no more acid-forming bacteria than does pasteurized milk."

A study of streptococci from milk and from epidemic sore throat, and the effect of milk on streptococci, E. C. ROSENOW (*Jour. Infect. Diseases*, II (1912), No. 3, pp. 338-346).—These streptococci were isolated from milk, from cream purchased in the open market, and from separator slime obtained from a milk clarifier. The results are summarized as follows:

"Streptococci, virulent for animals, but which differ from typical *Streptococcus pyogenes* in a more abundant growth, in being encapsulated and in forming chains, and in causing but little hemolysis, occur in predominant numbers in epidemic sore throat of milk-borne origin. On artificial cultivation these strains sooner or later assume the characteristics of *S. pyogenes*.

"Cultures on blood agar plates from ordinary milk usually give rise to colonies of streptococci that do not cause any hemolysis, but the injection of rabbits and other animals with milk 'slime' practically always produces infection with encapsulated, but otherwise typical, hemolytic streptococci. The blood agar plate method consequently is not a reliable means with which to search for *S. pyogenes* in milk. By placing *S. pyogenes* in unbeaten milk it becomes modified so as to correspond to the streptococci in epidemic sore throat. The modifications may be accentuated by passage through guinea pigs, and in some cases cultures like those of *S. mucosus* may result.

The fact that milk so modifies streptococci is an additional indication of the important part it may play in epidemic sore throat. It is not possible to determine whether the streptococci in such epidemics are of exclusively bovine or human origin; they may be of both. Milk drawn in a sterile way from normal cows may contain virulent streptococci and pneumococci; hence, 'sterilized' milk, while surely less contaminated than ordinary milk, may contain pathogenic bacteria, and the advisability of pasteurization even in this case should be considered, especially during seasons when sore throat is common.

"Butter and cream may contain virulent streptococci."

Micrococcus mucofaciens, a new species causing a milk defect, J. THÜRMANN and A. C. THAYSEN (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gesundheitsamt.*, 1913), No. 6, pp. 335-341; *Centbl. Bakt. [etc.]*, 2, Abt., 36 (1913), No. 15-18, pp. 359-365).—The name *M. mucofaciens* is given for a previously undescribed species of bacteria which produces a slimy fermentation in milk. Although somewhat variable in form it is distinctly a micrococcus type, varying in size from 0.5 to 2.4 microns in diameter. The optimum temperature for its development is about 33° C. with a range from 22 to 42°. Other properties when grown in pure cultures, which are quite different from most other species causing a slimy fermentation, are given in detail.

The effect of stabling upon the composition of goat's milk, F. G. KOHN (*anat. Tierärztl. Wchnschr.*, 21 (1913), No. 4, pp. 49-55).—The fat content, solids, and physical contents of goat's milk, when the animals are kept under different conditions, are reported. It is concluded that the quality of the milk is much better when the goats are kept in pasture than when confined in a stable.

[Dairying in Alabama], L. W. SUMMERS and L. W. SHOOK (*Alabama Col. Agr. Circ.* 18, pp. 97-128, figs. 11).—This contains practical information on feeding and managing dairy cattle, feed and care of the calf, the bull, and silos and silage.

The actual cost of producing silage on 9 Alabama farms is presented in tabular form, the average figures being as follows: Acres of corn grown 10.25, yield of corn 6.71 tons, cost per acre \$8.73, cost per ton of filling the silo 87 cts., and actual cost of silage per ton \$2.33.

The manufacture of Cheddar cheese from pasteurized milk, J. L. SAMMIS and A. T. BRUNN (*Wisconsin Sta. Research Bul.* 27, pp. 137-248, figs. 17).—This is a report of experiments made in devising a new method of making Cheddar cheese from pasteurized milk. The advantage of pasteurizing the milk in cheese making, difficulties to be met with, and previous unsuccessful attempts are briefly outlined.

The results of testing the effect of adding calcium chlorid and hydrochloric acid to restore coagulability to the curd are presented in tabular form. When the acidity of the milk used was low (0.16 to 0.18 per cent), the moisture content of the cheese made with calcium chlorid was high (40 to 44.45 per cent), but when the acidity was high (0.21 to 0.23 per cent), the moisture content was low (38 to 40 per cent); but in all cases where hydrochloric acid was added to the same milk instead of calcium chlorid, the moisture content of the curd was from 37.5 to 40 per cent whether the natural acidity of the milk was high or low. The hydrochloric acid curds always began to thicken from 6½ to 7 minutes after rennet was added, while with calcium chlorid, the first visible coagulation occurred earlier if the milk used was very ripe, and later if the milk was sweet, thus varying from day to day. The percentage of fat lost in whey was on the average about 0.14 per cent greater with calcium chlorid than with hydrochloric acid. The scores and criticisms show that the cheese

made with calcium chlorid were neither as uniform, nor so good in quality, as those made with hydrochloric acid.

Cheese from milk pasteurized at 100° C. were cleaner in flavor and score higher than the check; and in every case higher than the cheese pasteurized at 140 or 150°. Temperatures higher than 100° resulted in cheese inferior in flavor and texture.

The pasteurized milk curds retained moisture more tenaciously than raw milk curds, and this effect was more marked at the higher temperatures. The yield of cheese obtained by pasteurizing at 100° was slightly larger than that obtained from raw milk. Pasteurizing decreased the power of the curds to coalesce or mat when on the rack or in the press. Several types of pasteurizers were used, but there were no appreciable differences which could be traced to the use of different machines.

Although other acids were used, most of the cheese made from pasteurized milk were made with hydrochloric acid, and the use of this acid is decreased and recommended in the present bulletin. Cheese made with 0.75 per cent, 1 per cent, or 1.25 per cent starter were about equally good as regards flavor and texture.

Among other conclusions drawn were the following: "The green pasteurized milk cheese shrank a little more than the raw milk cheese, so that when paraffined, the average gain in yield from pasteurized milk was 4.76 per cent. After curing at 60 to 70° F. for about 100 days, the gain in yield of pasteurized milk cheese over raw was 4.22 per cent. The average loss of fat in whey from pasteurized milk is about 0.17 per cent, measured at the time the whey is drawn from the vat. This is less than half the loss in average factories using raw milk. The total loss of fat in whey and drippings from vat and press, using pasteurized milk, averaged 1.58 per cent of the weight of the cheese, or less than half that of the usual loss in handling raw milk.

"In addition to this saving of fat, it is found that a somewhat larger proportion of moisture is incorporated in pasteurized milk cheese than in ordinary cheese, without damage to the quality. The gain in yield of pasteurized milk cheese is therefore due partly to fat and partly to moisture. Scores and criticisms given by competent cheese judges show that the pasteurized milk cheese varied less in quality, and averaged better by 3.7 points of total score, than the raw milk cheese made from portions of the same milk supply. The pasteurized milk cheese scored higher than the raw milk cheese in 96 per cent of all cases.

"Duplicate sets of cheese were cured at New Orleans for 1 month at 70° to 83° (monthly average figures during the summer), and here the raw milk cheese was more in weight than the pasteurized, so that the average gain in yield of pasteurized over raw rose to 6.21 per cent. From other cheese cured at Madison in a warm room, it was learned that the raw milk cheese loses considerable amounts of fat at 75 to 85°, while the pasteurized milk cheese loses none.

"Storage for a month at 75 to 80°, average temperature, as at New Orleans is not recommended for any cheese, yet it was found that the pasteurized milk cheese averaged 3 to 8 points better in total score, after such storage, than the raw milk cheese. Since pasteurized milk cheese can be cured without injury at 70°, it is likely that in many cases the expense of cold storage for this cheese can be avoided. Pasteurized milk cheese can be put into cold storage at 34° at the age of 1 week, and possibly earlier without injury. . . .

"Preliminary estimates show that the maximum extra cost may be 45¢ for 2,000 lbs. of milk, with many chances for reducing the cost in handling larger quantities. Because of the increased yield of cheese, the saving in rennet and in cold storage charges, there is a saving of about \$2.23 in handling 2,000

of milk. . . . Allowing \$1 for cold storage charges on 200 lbs. of cheese, there is yet a profit of about three-eighths of a cent a pound through pasteurization."

Directions are given for pasteurizing, acidulating, use of starter, and all points for each operation involved in making the cheese by the new method. Cheese makers are advised to await the publication of results of further trials before undertaking to use it on a commercial scale.

Studies on the rational manufacture of Parmesan (Grana) cheese, C. G. GAST (*Zentrbl. Bakt. [etc.]*, 2, *Abl.*, 36 (1912), No. 15, pp. 52-53; *Milchz.*, *Zentrbl.*, 41 (1912), No. 21, pp. 641-659; *abs. in Chem. Zentrbl.*, 1913, 1, No. 1, p. 21). This is a third report (E. S. R., 20, p. 574), which deals with the causes of defects in Parmesan cheese. The author insists on the importance of more sanitary methods in the production and handling of milk and the use of pure cultures for ripening, as most of the defects are caused by the development of undesirable organisms. Reference is also made to the green color of cheese which sometimes occurs because the milk is held too long in copper receptacles.

Factors influencing the Swiss cheese production, E. KONRAD (*Markertidn.*, 1912), Nos. 41, pp. 329-343; 43, pp. 393-395). Observations on the manufacture of Swiss cheese, with special reference to the possible development of the industry in Denmark, are presented.

VETERINARY MEDICINE.

Handbook of veterinary surgery and obstetrics, edited by J. RAYER and E. FOMBER (*Handbuch der Tierärztlichen Chirurgie und Geburtshilfe*, Vienna, 1913, vol. 7, 1913, pt. 2, pp. XI+626, pgs. 219). In this second part of Volume 7 of the work previously noted (E. S. R., 27, p. 881) M. G. de Bruin deals with obstetrics as related to the smaller domestic animals (pp. 1-125), and M. Albrecht with equine obstetrics (pp. 131-675).

Studies of the historical development of animal breeding and veterinary medicine and their correlation, E. A. HAAS (*Studien über die Historische Entwicklung von Tierzucht und Tierheilkunde und ihre Correlation*, Inaug. Diss., Univ. Bern, 1912, pp. 68).—This inaugural dissertation includes a bibliography of 84 titles.

Annual report on the distribution of animal diseases in the German Empire (*Jahresber. Verbr. Tierseuch. Deut. Reichs*, 26 (1911), pp. VI+115+219, 1911).—In this report the extent and distribution of the important animal diseases occurring in the German Empire are considered. The details concerning the distribution of the diseases are given in tabular form, and maps showing the occurrence of rabies, glanders, foot-and-mouth disease, and sheep scab during the year 1911 are appended.

The results of meat inspection in the German Empire in 1909 (*Ergeb. Vöchtlich u. Fleischschau Deut. Reichs*, 1909, pp. IV+50+138, pg. 1).—This report presents the results of the meat inspection work in Germany, 1909, in tabular form.

Forensic-chemical detection of sabin oil poisoning, J. HÄMÄLÄINEN (*Scandinav. Ztschr.*, 48 (1912), No. 3-4, pp. 241-246).—The author prepared well characterized salts of sabinol-glycuronic acids. Among these the strychnin salt is adapted to detecting poisoning by sabinol. A dose of from 1 to 1½ cc. of sabinol (equal to from 3 to 4 cc. salinol) when given to an animal is sufficient to show the presence of sabinol-glycuronic acid as a strychnin salt in the urine.

In regard to examining the efficiency of the Strassburger method for detecting anthrax, A. ENGLER (*Experimentelle Untersuchungen Hinsichtlich*

der für die Bewirkung der Sporulation des Milchbrandbazillus Gezeichneten Substrate Vermittelt des "Straussburger Verfahrens" zum Nachweis von Milchbrand. Inaug. Diss., Univ. Bern, 1911, pp. 67).—Previously noted from another source (E. S. R., 26, p. 678).

The production in vitro in the normal brain of structure simulating certain forms of Negri bodies, EDNA STEINHARDT, D. W. POOR and R. A. LAMBERT (*Jour. Infect. Diseases*, 11 (1912), No. 3, pp. 459-463, pl. 1).—When the cells of normal guinea pig brains were incubated in blood plasma, small pink-staining bodies (stained by Van Gieson's method) surrounded by a blue granular ring were observed in the cytoplasm. The bodies were indistinguishable from the unstructured Negri bodies frequently found in the rabid guinea pig brain. In a few cases the forms contained a central blue staining point or ring and closely resembled some of the smaller structured forms of the Negri bodies.

Normal guinea pig brains treated with street or fixed virus, incubated in the same manner, showed the same structures. "The brains of guinea pigs dying of street virus, and rabbits dying of fixed virus, incubated in small fragments gave no development of the Negri bodies in blood plasma, beyond the small structured and unstructured forms, although in one preparation the guinea cells appeared to be living at the end of 21 days' incubation."

A contribution to the knowledge of the trypanosomes occurring in healthy cattle, P. P. VAN DER POEL (*Beiträge zur Kenntnis der bei Gesunden Rindern Vorkommenden Trypanosomen*. Inaug. Diss., Univ. Bern, 1912, pp. 75).—The dissertation consists in large part of a detailed review of the literature relating to the subject. The paper closes with a brief discussion of personal investigations, and a bibliography of 27 titles is appended.

During the course of examinations of the blood of 75 cattle at the National Serum Institute at Rotterdam in November and December, 1911, and January and February, 1912, trypanosomes were found by the author in the blood of 14, or about 21 per cent, of the 66 grown cattle. Morphologically the parasites resemble *Trypanosoma transvalense*, a variety of *T. theileri*.

Studies on the biochemistry and chemotherapy of tuberculosis.—I. The permeability of tubercles for iodine compounds and proteins, H. G. WIGG and O. F. HEDENBURG (*Jour. Infect. Diseases*, 11 (1912), No. 3, pp. 349-372).—It is shown that compounds of iodine injected into tuberculous animals enter glandular tubercles with readiness, so that the proportion of iodine in such tubercles is usually greater than it is in most other tissues except the kidney; furthermore, it is greater in the caseous contents than in the cellular periphery of the tubercles. Tuberculous eyes usually contain much more iodine than their normal mates. This property is shown not to depend on any specific character of the tubercle itself, for other necrotic tissues also take up more iodine than normal tissues. The explanation offered is that normal cells are not perfectly permeable to iodides (except perhaps kidney cells) and lose this impermeability or semipermeability when killed or injured, thus becoming entirely permeable for crystalloids present in the surrounding fluids. As the iodine content of the blood increases and decreases with absorption and elimination, so the iodine in the necrotic area, whether tuberculous or otherwise, varies, indicating an absence of any chemical or physical binding of the iodine in such areas. A simple, inert, colloid agar, implanted in the tissues, behaves in quite the same way.

"Egg albumin injected into tuberculous pigs is found, by means of the anaphylaxis reaction, to penetrate the avascular tubercles but little if at all, even when present in the blood in large amounts. This agrees with the hypothesis that the passage of iodine from the blood into the tubercles is a

purely physical matter, the crystalloidal iodine compounds diffusing through the inert colloidal solution of a necrotic area practically unimpeded, while the colloidal egg albumin, according to the law of colloidal diffusion, is practically unable to diffuse through such a colloidal solution.

No evidence could be found of any tendency for iodine compounds of whatever nature to accumulate in tubercles or other necrotic areas, or to persist in such areas when disappearing from the normal tissues and the blood.

Exudates contain approximately the same proportion of iodine as the blood of the same animals, and hence any area with inflammatory edema and congestion will commonly show more iodine than normal tissues, although not greatly more than the blood. No evidence was found of any specific entrance or fixation of iodine in inflammatory exudates. The iodine is distributed about alike in the fluid and solid portions of the exudate, indicating simple diffusion. Of normal tissues only the kidney seems to contain approximately as much iodine as the blood of the same animal. This may have some bearing upon its excretory function, since it indicates a greater permeability of renal cells than of other gland cells for iodides."

The hydrolysis of the tubercle bacillus, N. O. SUMNER (*Centbl. Bakt. [etc.]*, 1911, *Orig.*, 66 (1912), No. 7, pp. 554-556). By subjecting 1 gm. of tubercle bacilli to the action of from 300 to 350 cc. of 1.5 per cent hydrogen peroxid for 1 to 2 hours in an autoclave at 143° C. and a pressure of 3 atmospheres, a perfectly clear and colorless solution is obtained.

Tuberculo-infection of man through animals and animal products, A. O. ZACK (*Amer. Vet. Rev.*, 41 (1912), No. 5, pp. 545-566).—A presentation of the various facts which stand out favoring the theory that bovine tuberculosis is transmissible to man.

Immunity and therapy of tuberculosis, A. BRUSCHETINI (*Centbl. Bakt. [etc.]*, 1. *Abh. Orig.*, 66 (1912), No. 7, pp. 531-537).—The serovaccine prepared by the author was found to act directly upon the various factors concerned in the tubercular process, the causative specific organism, and the diseased tissue. The result, although slow to obtain, is certain and lasting.

Can tuberculous antibodies be produced in sound animals? K. REINHARDT (*Ztschr. Hyg. u. Infektionskrankh.*, 73 (1913), No. 3, pp. 427-442).—It is possible to produce tuberculous antibodies in sound and tubercular animals. Even though the titer obtained was not very high, it was higher than that obtained by other authors with tubercular animals.

Tuberculosis in cattle and how to combat it (*De Tuberculose onder het Runder en Hare Bestrijding*, The Hague, 1911, pp. 35).—This is a statement in regard to the nature of tuberculosis, its dissemination, and how to combat it. The measures taken by the Dutch government to prevent the spread of this disease, and a resolution adopted December 1, 1910, giving the rules and regulations for combating tuberculosis in cattle, are stated.

The query sheet employed by the government agents is shown.

Infectious abortion in cattle, W. GILTNER (*Amer. Vet. Rev.*, 42 (1912), No. 2, pp. 145-156).—After reviewing the literature and discussing the status of our present knowledge of this subject, the author reports his results with abortin prepared in the bacteriological laboratory of the Michigan Experiment Station.

Attention is drawn to the fact that alarming symptoms follow the use of abortin when injected intravenously, whereas by giving the substance subcutaneously no untoward results are noted. The findings with various animals were grouped under 5 headings: (1) No reaction, no abortion; (2) reaction, no abortion; (3) abortion, no reaction; (4) abortion, reaction; (5) not pregnant, no reaction.

The author was unable to check up the results by one or both of the serum tests. As was to be expected, none of the first group of animals was clinically affected and consequently did not react. The possible reason that the second group of animals did not abort is because abortin is believed to confer a certain degree of immunity. As for the third group of animals, "3 of the animals failed to react, although they had aborted and had reacted to a previous test made at a time nearer to the act of abortion. Possibly the failure to react to a second test is attributable to the effects of the previous injection of the reagent. This is the case in tuberculin testing many times."

The abortin test as a reliable diagnostic agent in infectious abortion has narrow limitations. "In favor of the abortin test is the possibility of its easy application by the practicing veterinarian, who has no laboratory facilities or who has no special training in serum diagnosis." A well-known remedy well advertised remedy against contagious abortion was found to consist of 98 per cent of water, and the remainder of phenols (carbolic acid), clove cloves, and some material resembling vegetable matter.

Acting on the theory that this disease in cows is a local uterine infection, attempts were made to immunize a virgin heifer with living cultures of the abortion bacillus in the belief that immunity will be phagocytic as in many other local infections. This heifer with another untreated heifer was tested 12 days after the last inoculation. "After about $4\frac{1}{2}$ months of pregnancy both heifers were injected intravenously with 10 cc. each of a typical culture of *Bacterium abortus* incubated 5 days. Only a slight temperature reaction followed in each case. No other effects of the inoculation were observed. Three months and 8 days later, or at nearly the eighth month of pregnancy, each heifer was again inoculated with 10 cc. of a similar culture intravenously and each received 30 cc. of the same culture in the vagina. No temperature reaction occurred. Each animal experienced a normal parturition." Probably the culture used was lacking in pathogenic properties.

"In concluding [the] discussion of immunity production, the following may be a practicable plan: Inject all nonpregnant females subcutaneously with the living culture once, twice, or more times, using 30 cc. more or less of culture. . . . All pregnant cows should be tested with abortin not so much for its diagnostic value as for its hypothetical therapeutic function."

Infectious vaginitis and endometritis in cattle, E. HESS (*Arch. Wirtsch. Prakt. Tierheilk.*, 38 (1912), Nos. 4, pp. 373-398; 5-6, pp. 457-513).—This paper reports studies carried on with or in continuation of those previously noted (E. S. R., 17, p. 1015). It takes up the etiology, diagnosis, course, spread, pathological anatomy, treatment, etc. A list of the literature referred to is appended.

Outbreak of rabies among station flock, O. L. PRIEN (*Wyoming Sta. Rpt.* 1912, pp. 60-71).—A brief report of the occurrence of rabies in 5 of 6 sheep of the station flock that had been bitten by dogs, together with the symptoms and pathology.

Sarcosporidiosis of sheep, O. L. PRIEN (*Wyoming Sta. Rpt.* 1912, pp. 67-69, figs. 2).—*Sarcocystis tenella* was observed in the myocardium of about 2 out of every 3 of the 60 odd sheep upon which post-mortems were held during the summer in connection with the work with poisonous range plants.

Wireworms in sheep and their treatment, A. THEILER (*Agr. Jour. Univ. So. Africa*, 4 (1912), No. 4, pp. 572-586, figs. 3).—In preliminary experiments here reported it was found that lambs could be dosed 10 times at weekly intervals with the maximal safe dose of Cooper's dip and bluestone without bad results. The dosing of pregnant ewes with the maximal safe dose was followed in 2 instances by the death of the twin offspring. The free access of

access to a lick, containing Cooper's dip and bluestone, for a period of 3 months, during which time one sheep consumed on an average daily 2.3 grains of Cooper's dip and 2.3 grains of bluestone, had no decisive effect on the worms.

Studies on the virus of hog cholera, W. E. KING and R. H. WILSON (*Ztschr. Immunitätsf. u. Expt. Ther., 1. Orig., 16 (1913), No. 3, pp. 367-376*).—"The present paper is based partly upon results [previously noted (*E. S. R.*, 24, p. 200)] and partly upon experiments which have been conducted since that publication."

From this work it appears that when hog cholera virus remains in the blood of the horse for from 30 to 60 minutes, an activation of the virus seems to take place. In a series of 48 hogs 85.2 per cent died as a result of increasing injections of this horse serum virus. In 2 other series of tests made for the sake of comparison 11 and 10 hogs were treated with the virus, the series with 11 hogs receiving horse serum virus prepared by adding the hog cholera virus and horse serum in vitro. In these 2 series 54.1 and 60 per cent, respectively, of the animals died. The same quantitative relations were observed in all of the series and in every instance the same virus was used. The average period of incubation was 6.3, 10.3, and 12.8 days, and the average period of sickness 14.9, 17.4, and 19.1 days respectively.

When sound hogs were given the horse serum virus, the incubation time was found to be shorter in hogs which were treated with equal amounts and the same dilution of virus and horse blood in vitro, physiological salt solution and hog cholera virus, or undiluted hog cholera virus. The minimum fatal dose of virulent serum as prepared by dilution with physiological salt solution did not seem to be equivalent to the minimum fatal dose of the virus diluted with horse serum, i. e., horse serum virus. Hog cholera serum when given to horses intravenously produced more toxic symptoms than when a normal hog serum was given in the same manner.

Hog cholera in Manitoba, C. D. MCGILVERAY (*Amer. Vet. Rev.*, 42 (1912), No. 3, pp. 301-307).—This paper was presented at the annual meeting of the American Veterinary Medical Association, held at Indianapolis in August.

Outbreaks of hog cholera were reported from the vicinity of Winnipeg during 1886 and near Carman in 1899, since which time it did not reappear until August, 1911, when it was found to occur among pigs in the district immediately surrounding the city of Winnipeg. Almost simultaneously, other outbreaks were reported in the vicinity of other urban centers of western Canada. Investigations show the infection to have been introduced in kitchen garbage from hotels and restaurants.

The efficiency of anticholera serum as a curative and preventative agent, L. A. CRAIG (*Amer. Vet. Rev.*, 42 (1912), No. 2, pp. 200-205).—This paper points out particularly the causes for failure in antihog cholera vaccination. The procedure as followed at the Indiana Experiment Station is stated.

A report of over three years' experience with the Schafer phylacogens in the treatment of infections in horses, F. M. SAWYER (*Amer. Vet. Rev.*, 42 (1912), No. 3, pp. 273-283).—As a result of treating various diseases with phylacogens, the author concludes that they are a reliable remedy for use in routine veterinary practice. Of the 546 cases treated, including distemper, influenza, surgical infections, laminitis, azoturia, navicular disease, etc., there was not a single death.

The mallein tests, C. J. MARSHALL (*Amer. Vet. Rev.*, 42 (1912), No. 2, pp. 182-189).—The results obtained seem to justify the conclusion that few glandered horses will escape detection by the thermic test. When this test shows negative, it should be verified by the ophthalmic test because all horses reacting

to the latter test can be safely destroyed. As a further precaution all reactors should be held 2 weeks longer, then samples of blood from them taken for the serum test and again tested with the thermic mallein test. Those reacting a second time with this test or giving an eye test should be considered glandered without further consideration.

When acute glanders or other febrile disease is present, mallein should not be used subcutaneously. At first the results obtained with the agglutination test were found to be variable but later became more reliable.

The technique of the ocular mallein test as carried out in Pennsylvania is given in detail.

RURAL ENGINEERING.

Report of the state engineer and surveyor, State of New York, 1910. F. M. WILLIAMS ET AL. (*Ann. Rpt. State Engin. and Surveyor N. Y., 1910, pp. 770, pls. 36*).—This report includes data on the operations of the year, tests of materials, surveys, the work of the land bureau, and stream gaging, together with a large amount of statistical, hydrographic, and other data.

Annual report of the state engineer and surveyor, State of New York, J. A. BENDEL ET AL. (*Ann. Rpt. State Engin. and Surveyor N. Y., 1911, pp. 457, pls. 55, figs. 2; sup., pp. 314*).—This report is in 2 parts, part 1 dealing with the state engineering administration and operations, including state barge canal and land surveys, tests of materials, and a large amount of tabulated statistical and other data. Part 2 is a report of the bureau of hydraulics of the state barge canal department, by J. P. Newton, and contains a large amount of hydrographic and stream flow data from the gaging of the streams of the State.

Irrigation and seepage experiment (*Rpt. Calcutta [India] Agr. Sta., 1911, pp. 31-39*).—This report includes the tabulated results of experiments extending over 6 years, showing the amounts of water necessary for the ordinary irrigated crops of the province and the seepage losses in field water channels at different times of the year.

A comparative statement, showing the duty of water for the different crops during the 6-year period, indicates for maize, from 2 to 9 waterings of from 60,000 to 70,000 gal. per acre per watering; for cotton, 1 to 3 waterings of about 70,000 gal. each; for potatoes, 4 to 5 waterings of from 40,000 to 60,000 gal. each; for wheat, 2 to 3 waterings of from 40,000 to 70,000 gal. each; for cane, from 12 to 24 waterings of 50,000 to 60,000 gal. each; for vegetables, 12 waterings of about 50,000 gal. each; and for peanuts 2 to 4 waterings of from 50,000 to 70,000 gal. each.

The figures for seepage and evaporation losses on a 150 yard channel were found to vary considerably in different years and at different periods of the year, reaching a maximum in the case of a dry channel used for the first time during the hot weather, and the minimum in channels used for several consecutive days in cold weather. The magnitude of the loss indicates that badly aligned and poorly maintained small channels are more responsible for loss than the actual overwatering of crops.

Elements of hydraulics. M. MERRIMAN (*New York and London, 1912, 1. ed. VI+156, figs. 86*).—This book presents the principles and methods of hydraulics without the use of higher mathematics, and deals in a comprehensive manner with those topics which are of greatest importance in practical hydraulic engineering work. It contains chapters on hydrostatics, theoretic hydraulics, flow from orifices and tubes, flow through pipes, flow in conduits and rivers, measurement of water, hydraulic motors, and pumps and pumping.

[Experiments with the properties and economics of tufa cements] (*Engin. and Contract.*, 38 (1912), No. 23, pp. 620-624, figs. 3).—This article gives the results of tests of the strength and economy of tufa cement, which is ordinary portland cement mixed with finely ground tufa in varying percentages. The conclusions from these tests are as follows:

(1) The tufa when finely ground with cement and used in concrete combines both chemically and mechanically. (2) Blends of 50 per cent when mixed with sand give greater tensile strength after 10 days than straight cement mixed with the same proportion of sand. The leaner the mixture the greater the relative superiority of tufa cement. In compression the tufa cement concrete is 30 per cent weaker in rich mixtures and as strong in leaner mixtures. (3) Tufa cements in tension of blends from 30 to 80 per cent show a continued growth in strength with age up to 5 years. (4) Tufa concretes must be handled with greater care with reference to both cold and drying, and forms should be left in place about one-third longer. (5) Tufa cement makes a denser and more impervious concrete since the gradation of fineness is carried one step further than in ordinary concrete.

Curves and tabulated test data accompany this report.

Electrolysis of concrete, E. R. ROSA, R. McCOLLUM, and O. S. PETERS (*Engin. News*, 68 (1912), No. 25, pp. 1162-1170, figs. 3).—The results are given of a series of laboratory and field experiments on the effects of electric currents in plain and reinforced concrete.

Both anode and cathode effects were observed in reinforced concrete under high and low voltages. In the anode tests it was found that rapid corrosion of the iron took place, sufficient iron oxid forming between the iron and the concrete to cause cracking and disintegration of the concrete. This happened much more quickly and was more marked with the high voltage than a low one, and it is concluded that the rate at which damage occurs decreases with decreasing voltage much more rapidly than the voltage is lowered.

In the cathode tests it was found that the concrete softened and disintegrated for about one-fourth of an inch next to the iron, reducing the bond strength between iron and concrete to about one-fifth of its normal value. This is due to the concentration of the sodium and potassium alkalis in the concrete at the negative terminal, the concentration finally becoming of sufficient strength to attack the cement, destroying the calcium silicates and aluminates, and forming soluble sodium and potassium silicates and aluminates and calcium hydroxid.

The tests with plain concrete indicate that the passage of electric currents does not seriously affect its crushing strength.

It was found that the use of salt or calcium chlorid in concrete, which is done to prevent freezing in cold weather, hastened corrosive action on the reinforcing and that the resistance decreased as the test proceeded. The conclusion is that the presence of salt prevents the precipitation of calcium carbonate at ordinary temperatures so that plugging of the pores and consequent rise in resistance can not occur.

For protective measures it is suggested that salt or calcium chlorid be excluded from concrete and that the surfaces of foundations of concrete structures be water proofed. The wiring of structures should be carefully insulated, especially in small private electric plants, where ground detectors should also be installed.

The effect of hydrogen sulphid on the concrete of sewage disposal plants, W. M. BARR and R. E. BUCHANAN (*Forw. Engin. Exp. Sta. Bul.* 26, 1912, pp. 18, figs. 4; *Engin. News*, 68 (1912), No. 24, pp. 1395-1397).—The results of

experimental investigations of the action of hydrogen sulphid on the concrete structures of several sewage disposal plants indicate the following:

(1) In septic tanks hydrogen sulphid is produced by the bacterial decomposition of sulphur-containing proteins and related compounds, and by the bacterial reduction of sulphates which are contained in unusual amounts in the water supplies. (2) The hydrogen sulphid which escapes as a gas from the sewage, particularly in the dosing chamber, is partially dissolved in the moisture on the underside of the roof and concrete walls, where it is oxidized to sulphuric acid, partly by atmospheric oxidation and partly by bacterial action. The sulphuric acid acts upon the calcium compounds in the concrete forming calcium sulphate. This takes up water of crystallization and swells considerably, the result being a cracking and pulverizing action and consequent disintegration of the concrete.

A new process of timber preservation (*Engin. News*, 68 (1912), No. 21, p. 954).—A new preservative treatment for timber is outlined, consisting of melted paraffin with silica in suspension, combined with a certain percentage of naphthalin. The naphthalin causes expansion of the pores and ducts of the wood which expels the moisture and sap contents and draws in the preservative mixture. The mixture upon cooling forms a solid coating of all the interior ducts and pores. Tests indicate that it does not leach out, is impervious to water and all organic acids, and prevents the entrance of the spores which destroy the wood tissue.

The cost of the preservative is about 3 cts. per pound, and tests indicate that a small quantity per cubic foot will completely permeate the material treated.

Tests of the strength of creosoted bridge timbers (*Engin. News*, 68 (1912), No. 24, p. 1045).—A summary of results is given of investigations of the effect of creosote treatment upon the strength of timber.

Directly after treatment the results showed very little difference in the strength of the treated and untreated timbers. One year after treatment the average amount of creosote lost by weathering was 3.7 lbs. per cubic foot, and in all the tests a considerable increase in strength was shown. It is concluded that long-leaf pine timber, which has been subjected to the full creosoting process, is in no way inferior in strength to untreated timber.

Tests with stumping powder, W. H. LAWRENCE (*Washington Sta. Bul. 7, spec. ser.*, pp. 118-120).—Tests were made on cedar standing in a muck soil varying from a few inches to 3 or 4 ft. in depth and underlain with a hard pan or blue clay. The area was too wet to admit of clearing by burning or the char pit method. Some preliminary attempts to remove the stumps by placing 1 charge beneath and at the center of the crown of the stumps were ineffective since the very wet and loose soil was merely thrown from beneath the stump thus leaving a depression which immediately filled with water.

In cooperation with the Bureau of Plant Industry of this Department experiments were conducted (E. S. R., 27, p. 189) in which the explosive was placed where deemed necessary and then discharged by an electrical current. Holes were made with a 3 in. auger which would admit of tying 3 of the 1½ in. sticks of powder together and placing them in the hole at one time. The table of results gives information concerning the kind, size, and condition of the stump and roots, and illustrates the more effective work of a battery in blasting stumps than with the single-lead-fuse method.

Tests of wood, paper, and steel pulleys, H. A. WOODWORTH (*Power*, 56 (1912), No. 24, pp. 848-850, figs. 7).—An account is given of tests made to determine the strength of several 24-inch pulleys of different kinds with a view to disclosing their principal points of weakness.

The pulleys were revolved in a suitable testing plant at speeds varying from 50 to 2,400 revolutions per minute. The wooden pulleys failed at peripheral speeds ranging from 232 ft. per second to 285 ft. per second, and the split-rim wooden pulley had only 80 per cent of the strength of the solid-rim wooden pulley. The paper pulleys failed at peripheral speeds of about 295 ft. per second. The split-steel pulleys failed at peripheral speeds of about 235 ft. per second, but the solid-steel pulleys were revolved at peripheral speeds as high as 300 ft. per second without failure. The conclusions are as follows:

(1) Balancing the pulleys in the rim causes failure at low speeds and thereby lowers the factor of safety. (2) Rim joints midway between arms are serious defects and materially reduce the bursting speed. (3) The solid-web-and-rim paper pulleys will safely withstand a rim speed of 106 ft. per second. By properly strengthening the rim the speed may be materially increased and a sufficient factor of safety retained. (4) Wood pulleys with solid rim have an ample factor of safety and a rim speed of 90 ft. per second if the wood is of good quality. The speed of this pulley may be increased by using lighter bolts at the ends of the arms, as the weight of the bolts caused the original fracture in 90 per cent of the pulleys tested. (5) Wood split pulleys will have a sufficient factor of safety at 72 ft. per second rim speed. The design may be improved by using lighter bolts and discontinuing the practice of balancing in the rim. (6) The solid iron pulleys, if of good iron and free from serious cooling strains, will be safe at a rim speed of 120 ft. per second. (7) Steel pulleys of the split-rim type are unsafe at speeds above 80 ft. per second.

The use of a light iron plow in paddy cultivation, N. WICKRAMARATNE (*Trop. Agr. and Mag. Ceylon Agr. Soc.*, 39 (1912), No. 5, p. 393).—The results of 5 comparative tests of the native wooden plow and a light iron plow weighing 28 lbs. for preparing the ground showed that the average yield of grain per acre is from 25 to 50 per cent greater with the iron plow.

The driving of threshing machinery (*Impl. and Mach. Rev.*, 38 (1912), No. 452, pp. 1034, 1035).—This gives the results of recent French tests made to compare the cost of threshing by horsepower and by electrical energy. The same thresher was used in each case and was of the stationary type with a simple winnowing attachment. The beater was 1.6 meters long by 0.4 meter in diameter, and the winnower 0.8 meter long and 0.6 meter in width.

Two horses drove the machine at speeds varying from 600 revolutions per minute down to 538 revolutions and threshed 800 sheaves, each weighing 18 lbs. per 10-hour day. By electricity the thresher speed averaged 756 revolutions per minute, threshing 1,275 sheaves per 10-hour day. The electrical consumption averaged 1.74 kilowatts per hour. In both cases four men were required to feed and attend the thresher. The average cost of threshing by horse labor was 1.235 francs per hundred weight, and by electric motor 0.954 franc.

Cool storage of fruit, T. W. KIRK (*Jour. New Zeal. Dept. Agr.*, 5 (1912), No. 5, pp. 508-515, figs. 7).—Detailed plans and specifications are given of a warehouse for 4,000 bu. cases of fruit, running 8 hours per day. A smaller plant could be used by running longer hours, but as the first cost is very little greater the money saved by the shorter hours of running would more than compensate for the difference between the smaller plant and this one in a farmer's work. The cost of the building complete with the machinery as specified is estimated at £1,700 (about \$3,250).

The effect of intercepting traps in house drainage, E. WILLIS (*Surveyor*, 12 (1912), No. 1091, pp. 826-828).—This report of experimental investigations deals with the advantages and disadvantages of the intercepting trap, the

chemistry and bacteriology of sewer and drain air, and the ventilation of sewers.

The results of the experiments indicate that the intercepting trap must go, and the following means are suggested to provide for its omission: (1) improved flushing arrangements whereby rapid discharge of large volumes of water are obtained dully through every portion of the house drainage system; (2) effective double seals on all water closets, slop closets, sinks, lavatories, and baths; (3) effective ventilating pipes clear of the second water seal, and ventilating or puff pipes between the first and second seal; (4) entire abolition of fresh air inlets at or near the ground level; (5) the erection of all ventilating pipes above the ridge of the highest roof immediately adjoining and as far removed as possible from any window; (6) the provision of at least 1 trap of shallow water seal, not less than $\frac{1}{2}$ in. and not more than 1½ in., with provision, by drip tap or otherwise, for always keeping this sealed, and with vent pipe therefrom if the ordinary ventilating pipes were omitted on any branches from internal drains; (7) all waste pipes to be treated similarly to soil pipes as regards double seal traps and ventilation, and the abolition of open heads; and (8) means of efficiently flushing all ventilating and soil pipes.

RURAL ECONOMICS.

Systems of marketing farm products and demand for such products at trade centers, G. K. HOLMES (*U. S. Dept. Agr. Rpt. 98, pp. 931*).—This report treats of the movement of farm products from the farm to the consumer, describing each channel in detail. The simplest distribution is the direct one of delivery by farmers to consumer, where the consumer goes to the farm and makes his purchase, or the farmer takes his commodities to town and makes the sales either at the doors of the consumer or at the public market place. Next after this is the delivery by individual farmers or associations of farmers to individual consumers or associations of consumers. Among the varieties of middle men concerned in the marketing of farm products as noted by the report, are country bucksters, the country merchant, grain buyer or local elevator man, and the commission merchant or wholesale dealer. Instances are given showing where marketing transactions frequently involve from 2 to 4 middle men. It being noted for example that onions raised in Kentucky are sometimes bought by a local merchant and shipped to Louisville, where they are put in sacks and consigned to a New York wholesaler, who in turn sells to a retailer, and he to the consumer. Other farm products frequently pass through a similar channel.

Another institution which aids the producer to dispose of his stock is the public warehouse, where the grower or his representative with his produce meets the buyer. Illustrations of this are afforded in the marketing of tobacco in Virginia and North Carolina, wool in the northern Rocky Mountain States, and to some extent rice in Louisiana and Texas.

The report gives considerable space and attention to associative marketing, which is considered the best system under favorable conditions. Among the economic advantages of cooperative marketing noted are the lower freight rate of the carload shipments; the command of transportation facilities by a street association, perhaps at a time when the individual shipper would be neglected and powerless; the prompt news service with regard to prices and conditions in trade centers, where the association sells its products; the ability of the association to direct shipments in transit to the best markets; uniformity in grading and packing products; and the establishment of a good reputation for quality.

The bulk of the bulletin is made up of a large amount of data and detailed information as to marketing specified crops, type of distribution, market requirements, finding a market, etc. Brief accounts are given of the systems of marketing in vogue in 66 associations, mostly handling fruits and vegetables. Part 2 presents data as to the demand for the various products at the different trade centers.

Report upon cooperation and marketing. J. F. SINCLAIR (*Wis. Bd. Pub. Aff. 10v. Sheets, Coop. and Marketing, 1912, pls. 1, pp. 132; 2, pp. 27; 3, pp. 38; 4, pp. 40*).—These publications present the results of a recent investigation of agricultural cooperation and marketing conditions in the State of Wisconsin, the purpose being to show the possibilities of such cooperation and the dangers to be guarded against. Part 1 treats of agricultural cooperation; part 2, of cooperative credit; part 3, in which C. Hallam is joint author, of municipal markets; and part 4, of distributive or store cooperation. Notes and data are given showing the history and progress of agricultural cooperation in Denmark and Ireland, also what has been accomplished in Wisconsin in the way of cooperative breeding and cow testing associations, live stock shippers' associations, fruit growers' associations, cooperative warehouse elevators, marketing of eggs, and mutual telephone companies.

The appendix to part 1 contains the law enacted by the state legislature in 1911 for forming agricultural cooperative organizations, a list of associations organized under the law, suggested articles of incorporation, by-laws, and farmers' agreements, together with a lengthy bibliography on agricultural cooperation and marketing.

Rural credit. G. K. HOLMES (*Business America, 13 (1913), No. 2, pp. 111-127*).—This article is based largely upon results obtained from a recent investigation conducted by the U. S. Department of Agriculture pertaining to agricultural credit in rural counties of the United States, the information being received from about 9,000 persons, consisting of country bankers, farmers, and country merchants.

According to the reports submitted it is found that 77 per cent of farmers owning their land are able to give good security or indorsed note for a loan, the corresponding percentage of tenants being 46. About 48 per cent of the correspondents reported that farm owners able to give good security or indorsed note are able to obtain short-time loans. The other correspondents reported that 36 per cent of farm owners in their communities are unable to do so because of insufficient opportunities to borrow. Reports from 47 per cent of the correspondents show that such farm owners are able to secure long-time loans, while the remaining correspondents reported that 40 per cent of the farm owners were unable to do so. The corresponding percentages for tenants are about the same.

Reports from 7 per cent of the correspondents show that farmers owning their land who raise cotton do not place a lien on the growing crop to secure advances or supplies, while the remaining correspondents reported that 42 per cent of the farm owners do, and that 52 per cent of them did so 10 years ago. Corresponding data for tenants show 2 per cent, 74 per cent, and 77 per cent, respectively.

It is noted that the local banks supply more than half of the agricultural credit, a large part of the remainder being supplied by general stores. The rates of interest range from 6 to 8 per cent.

The total agricultural debt is estimated at \$5,000,000,000, the mortgage debt alone on farms in 1910 being reported at \$2,293,160,278 as compared with \$1,085,995,960 in 1890, or an increase of over 100 per cent in 20 years, still the

mortgage debt on farms operated by owners in 1900 was 35.5 per cent, and in 1910 only 27.3 per cent, of the value of the mortgaged farms.

The author makes some observations regarding the sufficiency of agricultural credit to supply the demand, the probability of effectively using additional credit if obtainable, and the establishment of large land mortgage companies which would issue long-time bonds against the security of their mortgage loans in mass.

Rural credit in Germany, H. C. PRICE (*Columbus, Ohio, 1913, pp. 31*).—This publication presents in a general way the results of a personal investigation and study of German institutions which furnish both real and personal credit to German agriculture, showing their particular field of operation and the relative importance of each. Brief descriptions are given of the following institutions that furnish what is known as real credit to the farmer: (1) Co-operative land mortgage associations, (2) land credit banks, (3) mortgage banks, (4) public savings banks, (5) insurance companies, (6) provincial auxiliary banks in Prussia, (7) revenue banks in Prussia, and (8) land improvement banks. The institutions described as giving personal credit are (1) Raiffeisen banks and (2) Schulze-Delitzsch banks.

The farmer and finance, M. T. HERRICK (*Atlantic Mo. III (1913), No. 2, pp. 170-178*).—This article presents a lengthy discussion of the financial side of agriculture, showing inadequate facilities for agricultural credit in America as compared with the complete and successful systems of rural credit in a number of foreign countries, the workings of which are fully described and illustrated.

Principles of farm management, H. HAMANN (*Mitt. Landw. Inst. Leipzig, 1912, No. 11, pp. 135-257*).—In addition to describing agricultural conditions in Dresden this article presents in detail notes and data showing the essential factors of farm management and the fundamental relations existing between those factors, as climate, soil, elevation, population, transportation facilities, labor, farm machinery, crop rotation, fertilization, plant and live stock production, etc.

Cost of production, E. C. SEIDMAYR (*Mitt. Landw. Lehrkanz. K. K. Hochsch. Bodenkul. Wien, 1 (1912), No. 2, pp. 251-279*).—The author discusses and illustrates the relation between agricultural income and the cost of production, showing the proportionate amount of capital required for general running expenses, live stock, machinery, buildings, farm implements, improvements, etc. Concrete illustrations are given showing the cost of producing various agricultural products in Austria. The total cost of producing sugar beets, including seed, fertilizers, labor, farm implements, amortization, maintenance, rent, etc., is estimated at 757.73 crowns per hectare (about \$62.27 per acre). Similar notes and data are given as to the cost of producing wheat, barley, milk, and other farm products.

The cost of producing timothy hay on a New Jersey farm, F. S. BARLOW (*Tribune Farmer [New York], 12 (1913), No. 588, pp. 5, 7, fig. 1*).—The details of the cost of growing 500½ tons of hay on 223 acres in 3 successive years are here presented, together with an account of the methods used. The average cost per ton for the 3 years was \$13.58, and the average cost per acre \$31.28.

Practical farm accounting, Set "B," A. STAUFFER (*Broken Arrow, Okla., 1912, pp. 25*).—This pamphlet presents a simple method of keeping farm accounts, illustrating it by showing some farm transaction for each day of the year.

Rural economy in the Bombay Deccan, G. KEATINGE (*New York, Bombay and Calcutta, 1912, pp. XX+212, pls. 5*).—The author in this volume endeavors to show in detail the circumstances which affect the main factors of production, namely, land, labor, and capital, and correlates them with the question of

markets and prices. He makes a number of suggestions for improving the economic conditions of the farmer through his own efforts, also by means of government assistance.

Charts are given showing the variations of real and nominal wages of agricultural labor in Ahmadnagar for a period of years, fluctuations in the price of grain from 1821 to 1910, and the expansion of cotton cultivation in the Bombay Presidency during the last 40 years.

Constructive rural sociology, J. M. GILLETTE (*New York, 1913, pp. XIII + 41, fig. 1*).—The author endeavors in this volume to define the scope of rural sociology by differentiating the difference between rural and urban communities; by distinguishing the types of rural communities in the United States and indicating the physical and social influences which have produced them; by considering the movement of population from country to city and the nature of the moving conditions; by comparing the advantages of country and city; and considering the improvement of agriculture, farm marketing, farm labor, and the farm home, so far as they concern rural community welfare.

A number of tables and illustrations of economic importance are given, among which may be noted are those showing the comparative mortality of the city and rural population; average cost of farm board; rates per hour for labor; hours worked per day by men and horses; cost of keeping horses and horse labor; values consumed per acre from farm machinery; cost of production and feeding forage crops; distribution of profits on agricultural commodities; land tenure in the United States; and percentage of persons owning and renting farm homes.

Crop Reporter (*U. S. Dept. Agr., Bur. Statis. Crop Reporter, 15 (1913), No. 1, pp. 8, figs. 8*).—Notes and tables are presented showing the percentage of the marketable potato crop held by growers and dealers on January 1 of each of the last 4 years; average prices paid to producers for potatoes; farm value of imported products on dates indicated; data as to Hawaiian sugar crops for the years ended September 30, 1911 and 1912; area and production of sugar beets in European countries, 1911 and 1912; quotations on ocean freight rates on grain from New York and New Orleans to Liverpool; monthly receipts and stocks of butter and eggs; farm value of important crops; uses made of the corn crop; a list giving number of fairs and exhibitions devoted to agriculture; live stock, and related subjects in 1912 by States and geographic divisions; area of vineyards and production of wine in specified countries; report on cotton ginning; tobacco in the hands of dealers and manufacturers; range of prices of agricultural products at important markets; and acreage, production and value of all crops in the United States, 1899 and 1909.

It is noted that there were 107 persons in Germany in 1907 engaged in agricultural occupations for every 1,000 acres used for agricultural purposes; and that there were 25 such persons to every 1,000 acres of improved land in the United States in 1900.

AGRICULTURAL EDUCATION.

Report of the Development Commissioners on their proceedings during the year ended March 31, 1912 (*Rpt. Develop. Comrs. [Gt. Brit.], 2 (1912), pp. II + 76*).—This report continues the work previously noted (*E. S. R., 23, p. 191*).

The expenditure actually recommended by the commissioners up to March 31, 1912, for agriculture, rural industries, and forestry, is as follows: To the Board of Agriculture and Fisheries, grants for £68,250 for agricultural research, experiments, and technical advice to agriculturists; \$455,250 for light horse breed-

ing; \$400,000 for the period ending March 31, 1913, for maintenance of farm institutes, this being the first installment of the grant of \$1,625,000 for the period ending March 31, 1916; and \$14,500 for forestry in England and Wales; to the Department of Agriculture and Technical Instruction for Ireland, \$17,500 for agricultural research, \$100,000 for light horse breeding, \$6,800 for forestry, and a loan of \$125,000 for forestry; to the Scottish Education Department, \$25,000 for extension work at the three Scottish agricultural colleges for 1911-12; to the Agricultural Organization Society of England and Wales, \$15,000 for 1911-12; to the Scottish Agricultural Organization Society, \$5,000 for 1911-12, for the promotion and maintenance of agricultural cooperative societies throughout Scotland; \$15,500 for the extension of the Rothamsted Experiment Station; \$4,250 to the British Bee-keepers Association; \$1,000 to Cambridge University for the provision of temporary quarters for the staff of the school of forestry; and \$55,000 to Edinburgh University for forestry instruction in the university.

The scheme for the extension of the system of agricultural education now approved by the commissioners provides for (1) the division of the whole country into 12 areas which center around the agricultural colleges, and grants to these colleges to enable them to make application of known results to local conditions, and to provide technical advice to local agriculturists, (2) grants to county councils to defray a part of the cost of farm institutes (educational centers which will give short winter courses or similar instruction and vacation courses for teachers of rural subjects in local continuation courses, and which will also be the headquarters of an increased county staff of itinerant teachers, advisers, and organizers) or farm schools for comparatively young boys. The administration of farm institutes and the control and distribution of the grant from the Development Fund for the institutes have been transferred from the Board of Education to the Board of Agriculture and Fisheries. The Treasury has decided that for the present at least, the ordinary teaching work of the agricultural colleges shall be aided, as heretofore, from the Board of Agriculture's regular funds and not from the Development Fund.

The function of the Massachusetts Agricultural College. K. L. BUTTRFIELD (*Mass. Agr. Col. Bul.*, 4 (1912), No. 1, pp. 5-24).—In the opinion of the author, "an institution of education supported by the government gains its main purpose from 4 sources: First, from legislation; second, from the historic policy of the college itself; third, from the realization of some fundamental need of society, that may be met by the college; fourth, from the changing aspect of this fundamental need, as expressed in new demands for service, which in turn call for new methods and even new types of work." These four propositions as to the source of an authoritative policy and a few preliminary considerations growing directly out of them are briefly discussed.

The real purpose of this college is defined as "to benefit the agriculture and rural life of Massachusetts, incidentally that of the Nation." The 3 main types of service which the college may render—investigation, instruction, extension, are developed at length. In addition to a discussion of the fundamental task of the college some observations are made concerning the college's relation (1) to the teaching of agriculture in the public schools, (2) to the normal schools, (3) to the board of agriculture, (4) to voluntary associations. It is maintained that "teachers of agriculture in high schools and special schools are clearly to be sought in the agricultural college."

The Lever agricultural extension bill (*Breeder's Gaz.*, 62 (1912), No. 11, p. 983).—In commenting on this bill, Eugene Davenport regards the present state of college extension work and the great amount of activity exerted in the form of platform addresses, the special train, and the like, as temporary and

bound to give place to the more permanent things such as: "(1) The experiment station, in the study of agricultural conditions and the discovery of principles of progress; (2) the traveling specialist, with his demonstration field or barn for the illustration and the application of newly found principles to the actual practice of the farm, in order that the findings of the experiment station may be quickly and thoroughly reduced to practice; (3) the agricultural college, in connection with the university, doing strictly collegiate work for those farmers who desire and can obtain a college education, not necessarily to fit them to be farmers, but to fit them to be men also; (4) the agricultural department of the public high school, which will undertake to give the technical training to the masses of men who are to be farmers; (5) a body of agricultural literature, standard and current, of which the agricultural press will form always the advance guard and the principal avenue of contact with the masses of men; (6) the agricultural associations representing more or less formal bodies of leading men engaged in the various commercial activities of agriculture; (7) a more or less closely organized community operating around a center within driving distance, and so conducted as to take care of the community interests—business, social, religious, and otherwise."

Preparation of students for higher agricultural education institutions, J. BESNARD (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908-9), pp. 500-504*).—The author discusses preparation in practical agricultural work.

Necessary grades of agricultural instruction on the American continent, C. D. GIBOLA (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908-9), pp. 425-428*).—The author concludes that agricultural instruction should be included in the course of study of the public schools from the elementary school to the university. The adoption of this plan would reduce agricultural instruction to 3 kinds, viz. practical, to be imparted in practical schools or farms with a minimum of theory and a maximum of practicums, intermediate, in schools of agriculture offering general or special agricultural instruction with proper attention to theoretical studies and their practical application, and higher instruction, to be given in higher institutions or faculties connected with universities, or independent, with the theoretical studies predominating. The courses of study of the 3 classes should so articulate as to lead from the lowest to the highest.

Instruction in zootechny, J. BESNARD (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908-9), pp. 490-499*).—General considerations and an outline of a course of study are presented.

Instruction in animal industry in the agricultural colleges of the United States, G. M. ROMMEL (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908-9), pp. 581-597, 517-531, pls. 11*).—The latter pages give this address in English. A brief statement concerning the nature of instruction in animal husbandry at the North American agricultural colleges is followed by a more detailed statement of the development of this instruction in the agricultural colleges of the United States, including outlines of courses for students specializing in animal husbandry in the University of Illinois and in the Iowa State College of Agriculture.

Agricultural instruction in Mexico, R. ESCOBAR (*Trab. 4. Cong. Cient. Santiago de Chile, 15 (1908-9), pp. 429-489*).—An account is given of the history of agricultural instruction in Mexico, the courses of study, regulation, etc., of the National School of Agriculture at San Jacinto, including the regional schools of agriculture established by the decree of January 1, 1879, as dependencies of this school, and the organization of agricultural instruction in France, Belgium, Italy, Germany, Denmark, Sweden, Switzerland, Hungary, United States, Chile, Argentina, and Japan.

Agricultural instruction (*Bol. Dir. Gen. Agr. [Mexico]. Rev. Agr.*, 1 (1911), Nos. 7, pp. 597-651; 8, pp. 695-753).—Data are presented as to the origin of the course of study of the National School of Agriculture and Veterinary Science at San Jacinto, an outline of the subject-matter of the course adopted in 1908, propositions for its reorganization submitted in October, 1909, and the decision of January 17, 1910, authorizing some of the modifications proposed.

Agricultural instruction in the teachers' institute of Montevideo, A. R. MONTEIRO (*Trab. 4. Cong. Cient. Santiago de Chile*, 15 (1908-9), pp. 415-421).—An account is given of the organization and work of the agricultural experiment field of the two normal institutes, one for men and the other for women, at Montevideo, Uruguay. Agricultural instruction was introduced into the normal institute for men some 15 years ago and into the institute for women about 6 years ago. It has been compulsory in the rural elementary schools for some time.

Special agricultural instruction, R. J. HUERGO (*Trab. 4. Cong. Cient. Santiago de Chile*, 15 (1908-9), pp. 398-409).—The advantages of the special over the general agricultural school are discussed and the plan of reorganization of special agricultural instruction in Argentina is outlined.

Agricultural extension instruction, R. J. HUERGO (*Trab. 4. Cong. Cient. Santiago de Chile*, 15 (1908-9), pp. 353-366).—The author discusses the objects of agricultural extension instruction and outlines the organization of the agricultural extension service adopted in Argentina in 1908.

The state-controlled agricultural schools of France, D. R. EDWARDS-KIN (*Jour. Southeast. Agr. Col. Wye*, 1911, No. 20, pp. 509-515).—The author gives a brief account of the 3 consecutive classes of agricultural education institutions in France, viz. the practical schools, the national schools, and the National Agricultural Institute, representing, respectively, practice, practice combined with theory, and advanced theory and research. Detailed accounts based on personal visits, are given of the Practical School of Agriculture at Antibes, the National School of Agriculture at Grignon, and the National School of Horticulture at Versailles.

The Retreat State Farm and School, DELORAINÉ, A. H. BENSON (*Agr. Gaz. Tasmania*, 29 (1912), No. 10, pp. 393-405).—This is a report by the director of agriculture to the minister of agriculture on the establishment and work of the Retreat State Farm and School at Delorainé, Tasmania.

Introduction to the teaching of elementary agriculture (*Trenton, N. J. Dept. Pub. Instr.*, 1912, pp. 10).—This publication presents a plan for beginning agriculture through some specific branch. Leaflets to serve as a guide for the line selected are to be furnished.

Corn growing (*N. J. Dept. Pub. Instr., El. Agr. Leaflet 3*, 1912, pp. 10).—This is one of the leaflets referred to above. Suggestions are given on method of study, material for study, corn growing in school and home gardens, relation of the agricultural work and other school subjects, girls' participation in the study of agriculture, and time to be devoted to the study.

[**Nature-study lessons**], ALICE G. McCLOSKEY, E. M. TUTTLE ET AL. (*Connecticut Rural School Leaflet*, 6 (1912), No. 2, pp. 187-202, figs. 10).—This leaflet contains brief outlines of lessons on winter birds, the potato, the locust tree, and suggestions on corn day in the rural school.

School gardening a fundamental factor in education, L. H. HAYES (*Moderator-Topics*, 33 (1912), No. 15, p. 287).—It is claimed that soil contact as it reacts upon the child creates producers and fosters adaptability, resourcefulness, and self reliance. Garden work is deemed auto-educative, since the planting and caring for the garden powerfully reflect the child's work and

bought. School gardening instills civic interest and engenders the esthetic, results in developing the faculty of cooperation, constitutes the "missing link" between the home and the school, and gives the child widened interests.

The school garden and fundamentals of education. O. W. CALDWELL. *Nature-Study Rev.*, 8 (1912), No. 7, pp. 248-252.—In considering the ways in which gardens appear to relate to fundamentals in education it is maintained that (1) the idea of producing things of value and beauty from the soil gives a motive, (2) the best results are derived when work and study, body and mind, go together, (3) a sense of ownership, pride, and budding independence is developed, (4) the best education in thought power comes through real problems such as are found in gardening, and (5) all the kinds of description—pictorial, verbal, and written—may be based upon garden and other elementary science work. "That knowledge is of most worth, which having led to growth in thought power and efficiency, at the same time leads to efficient productivity in some real work, a knowledge that leads to a belief in the dignity and worthwhileness of productive activity."

The organization of girls' poultry clubs. H. M. LAMON (*U. S. Dept. Agr., Bur. Animal Indus. Circ.* 298, pp. 11, figs. 5).—In addition to directions for organization, this circular offers suggestions concerning prizes and awards, reference literature on poultry, and gives specific information on the management of flocks, marketing eggs, and disposing of surplus birds. It is noted that the work of organizing the girls' poultry clubs described "is to be conducted by the Bureau of Animal Industry in cooperation with the farmers' cooperative demonstration work of the Bureau of Plant Industry."

Method of housekeeping instruction. G. LUNDBERG (*Methodik des Hauswirtschaftlichen Unterricht.* Leipzig and Berlin, 1909, pp. 55).—This book gives a review of the development of housekeeping instruction and discusses its necessity for and importance and objects of this instruction; its place in the curriculum of elementary and continuation schools and its relation to other subjects in the course; subject-matter, method of instruction, and equipment of the school kitchen and other rooms for instruction; the school garden; and the training and examination of teachers of housekeeping subjects.

MISCELLANEOUS.

Twenty-fifth Annual Report of South Carolina Station, 1912 (*South Carolina Sta. Rpt.* 1912, pp. 45).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1912, and departmental reports, a portion of that of the biologist being abstracted elsewhere in this issue.

Twenty-second Annual Report of Wyoming Station, 1912 (*Wyoming Sta. Rpt.* 1912, pp. 78, figs. 4).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1912, reports of the director and heads of departments, special articles, and a meteorological summary. The experimental data recorded are for the most part abstracted elsewhere in this issue.

A report covering the work of the Western Washington Experiment Station from November 1, 1907, to April 1, 1911, W. H. LAWRENCE (*Washington Sta. Bul.* 7, spec. ser., pp. 124, figs. 38).—This reviews the history of the substation, its present equipment, and its various activities. The experimental features are for the most part abstracted elsewhere in this issue.

Monthly Bulletin of the Department Library, November-December, 1912 (*U. S. Dept. Agr. Library Mo. Bul.*, 3 (1912), Nos. 11, pp. 335-364; 12, pp. 367-376).—These numbers contain data for November and December, 1912, respectively, as to the accessions to the Library of this Department and the additions to the list of periodicals currently received.

NOTES.

Kentucky Station.—A building for the breeding and rearing of guinea pigs, rabbits, mice, and other small animals has been erected at a cost of approximately \$6,000. This building is a story and a half and basement structure of red brick, with slate roof and stone foundation, and is 45 by 30 ft. The basement is cemented throughout and contains the pens and a feed room. On the first floor are 3 infection rooms, a sterilizing room, and 2 laboratories, one of which is for operating and can be kept aseptic. The laboratories and sterilizing room are finished in white enamel.

A new serum laboratory, to cost approximately \$11,000, is under construction. This will be a 2-story and basement brick building, 37 by 45 ft. The main floor is to be divided into a sterilizing room, a main laboratory, an operating room, and a room for preparing the animals. The laboratory is expected to be completed about May 1 and will have a capacity of about 200,000 cc. of serum per week.

Dr. R. L. Pontius, assistant veterinarian, resigned March 1.

Maine Station.—The legislature has granted an appropriation of \$5,000 per annum for animal husbandry investigations, and it is planned to take up studies as to the inheritance of milk production similar to those under way with egg production. An appropriation of \$10,000 was also granted for the purchase of a farm in Aroostook County to be under the control of the station and to be used for plant breeding and other investigations.

The director of the station has been relieved of executive duties connected with the enforcement of the various inspection laws beginning January 1, 1914. He will continue to be in charge of the analytical work.

Massachusetts College.—The college library has begun the issue of library leaflets of selected references along some special line of agriculture. Those now published are respectively for fruit growers, dairymen, and poultrymen.

Missouri University and Station.—The legislature has granted \$187,000 to the school of agriculture, of which \$25,000 is for a live-stock judging pavilion, \$50,000 for the hog-cholera serum work, \$30,000 for the station, \$25,000 for county farm advisers, \$20,000 for soil-test fields, \$12,000 for the soil survey, and \$5,000 for the State Corn Growers' Association.

Porto Rico Federal Station.—An appropriation of \$6,000 has been granted by the insular legislature for the erection of a plant and soil laboratory.

Rhode Island Station.—Director B. L. Hartwell has also been appointed agronomist.

Washington College and Station.—George Severance, of the Puyallup station, has been appointed head of the department of agriculture in the college and station and acting head of the extension department, and has been succeeded at Puyallup by W. A. Linklater, dean and animal husbandman of the Oklahoma College and Station. John G. Hall, of Clemson College, has been appointed professor of plant pathology in the college and plant pathologist in the station and has entered upon his duties. H. L. Rees, of the Oregon Station, has been appointed plant pathologist at Puyallup, and Benton Stookey, assistant agronomist.

